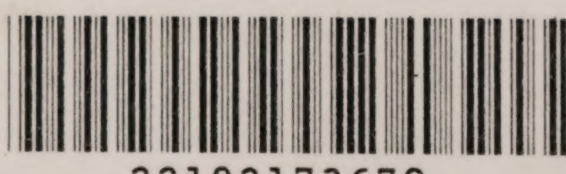
THE SURGERY OF EGYPT

Frank Cole Madden

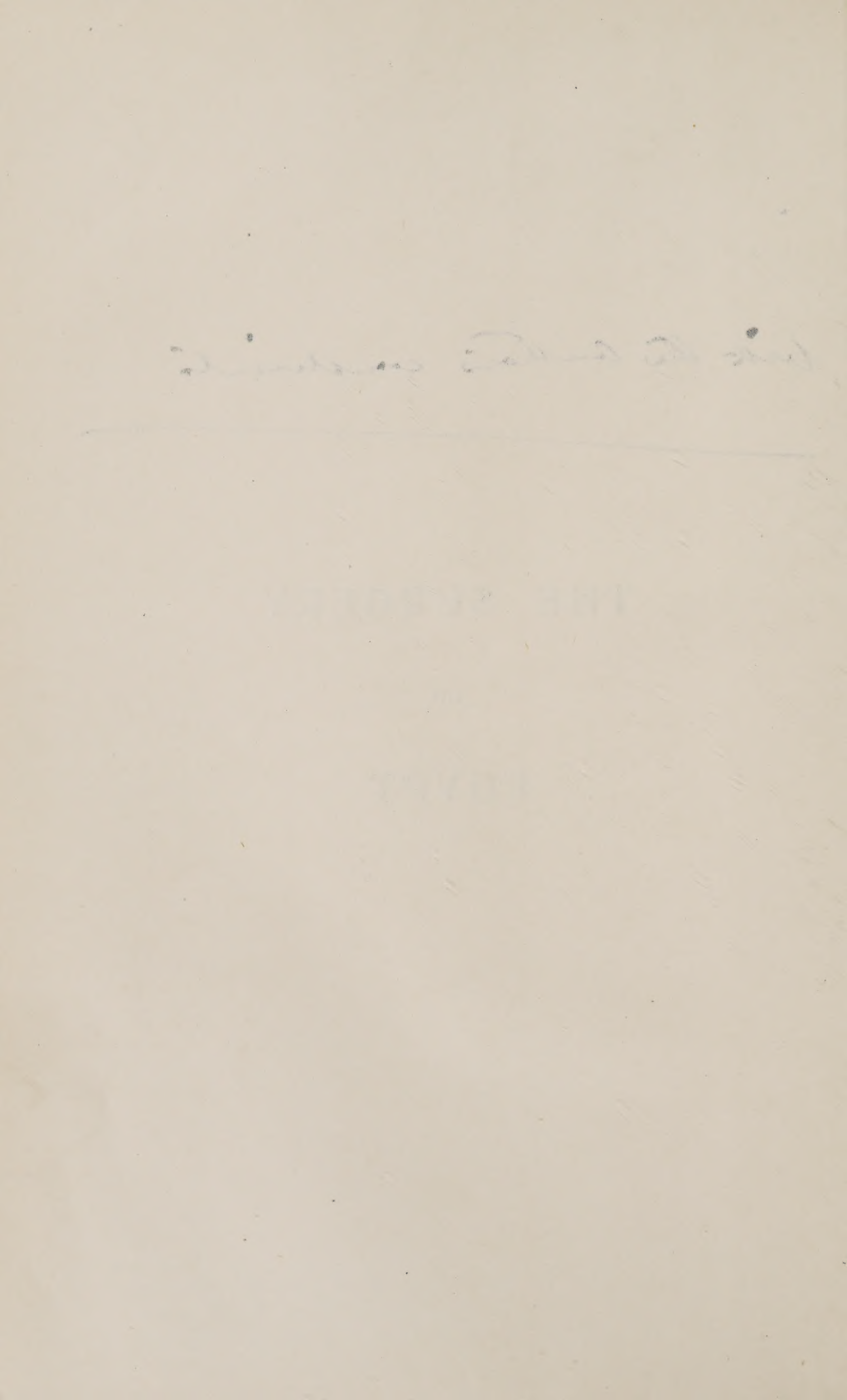


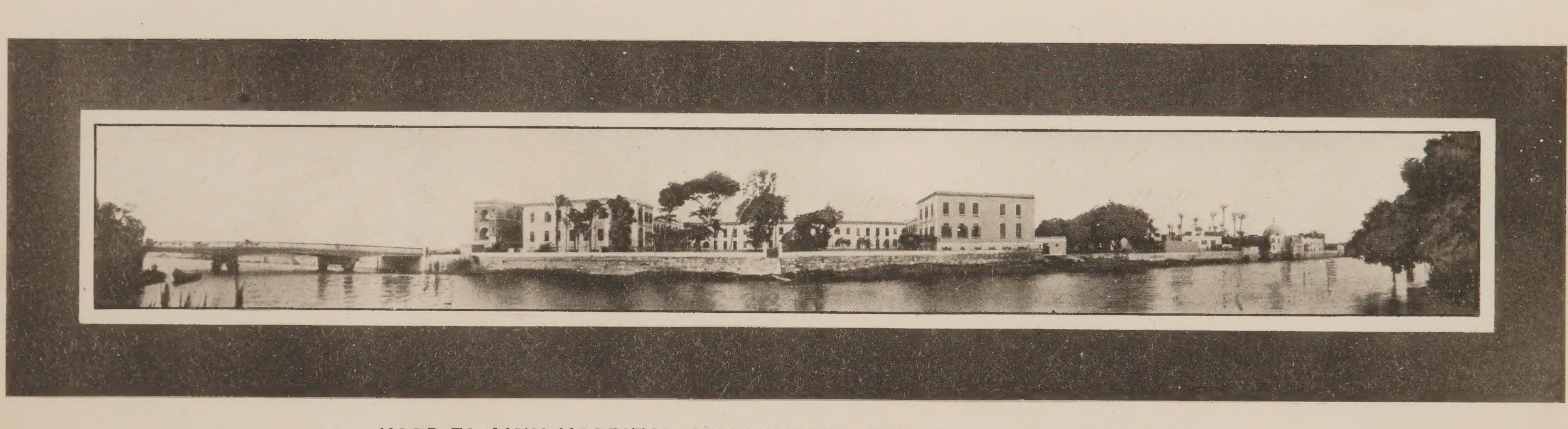
With the Author's compliments

THE SURGERY

OF

EGYPT





KASR-EL-AINY HOSPITAL AND MEDICAL SCHOOL FROM RODA ISLAND.

From a Panoramic Photograph by G. Smoly.

THE SURGERY
OF
EGYPT

BY

FRANK COLE MADDEN,

O.B.E.: M.D. Melb.: F.R.C.S. Eng.

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WITH 63 PLATES—ONE IN COLOUR—COMPRISING 238 PHOTOGRAPHS; AND 3 LINE DRAWINGS IN THE TEXT.

PRINTED AT

THE NILE MISSION PRESS, CAIRO.

1919

TO MY FATHER AND MOTHER,
TO WHOSE BLIND FAITH IN ME I OWE
MY WHOLE CAREER, THIS WORK IS
AFFECTIONATELY DEDICATED.

PREFACE.

In the present volume it has been my intention to put on record an experience of twenty years of Surgery in Egypt; primarily as a guide to the students of Kasr-el-Ainy, but also in the hope that it may be of some value to medical men whose lot it is to practise in the Near East.

I have endeavoured to describe the essentially Egyptian conditions in detail; and, at the same time, to point out wherein Egyptian Surgery differs from present-day English surgical practice. Surgery in general may be studied in Rose and Carless, or other modern English text-books, and the present work is intended to supplement, not to replace, these authorities.

The adoption of European standards of living, with all the defects of this more modern civilization, is rapidly exerting an injurious influence upon the more educated classes; in strong contrast with the antiquity and constancy of the diseases of the tiller of the soil, the fellah, who is as yet hardly touched, medically or socially, by the striking evidence of the modern civilised world around him. The more primitive the people, the less liable are they to 'fashionable' diseases, such as appendicitis, and other conditions, the direct results of civilization; but a change of environment, as seen in the transplantation of a tropical race like the Sudanese to the colder climate of Egypt, brings in its train a great risk of tuberculosis and other chronic and infective diseases, which flourish on virgin soil, and play sad havoc with frames and constitutions ill-calculated to stand the extremes of cold prevailing in the more temperate zone of Egypt. The power of resistance of the transplanted race appears to be almost completely annulled in these circumstances.

Moreover, an inherent fatalism, common among all Eastern peoples, frequently prejudices the prognosis of a case; not only by postponing medical advice till little result can be expected from any treatment, but also by invoking the peculiar power of dying at will, which is sometimes possessed and cultivated to a considerable degree among the poorer masses of the population.

It is, perhaps, hardly necessary to add that one must always be prepared for the unexpected in Egypt, and must not rely on things running along the obvious and natural path, even though their vagaries may be due to no apparent reason whatever, save only that "God wills it should be so." It is thus pre-ordained fate, a condition somewhat inadequately expressed in the oft misinterpreted symbol "(K)ismet".*

I have drawn largely, with, I hope, suitable acknowledgment, on much excellent work done by various members of the Staff of the Hospital and School; as I am anxious to make this book not merely a personal record, but thoroughly representative of the general principles of surgery as practised by myself, in conjunction with my colleagues, both past and present, at Kasr-el-Ainy.

The general arrangement of the work follows that of Rose and Carless' well known "Manual of Surgery"; and, so far as students are concerned, is intended to be read with it, chapter by chapter: thus supplementing their knowledge of the subject of surgery in general by an account of the local surgical conditions prevailing in Egypt and the Near East. For their benefit also, I have included as an appendix, the notes they have been working from for the last few years on 'A course of operations on the dead body.'

The illustrations are, in most instances, taken from photographs of actual cases in the wards and have been prepared for publication by the half-tone process. This has been undertaken by Mr. G. Douglas, the Head

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***Note.** This word loses its initial K in the colloquial Egyptian Arabic, and though frequently used, is not always recognised in this form by English ears.

of the Photographic Section of the Survey Department of Egypt; and I wish to take this opportunity of acknowledging my indebtedness to the Department, and to Mr Douglas, in particular, for all the care and trouble they have taken in their reproduction. With a depleted staff, and the great difficulty of procuring the necessary materials in war time, Mr. Douglas has been much handicapped: but has successfully completed his work in spite of all these drawbacks, and the result has been most satisfactory.

It may perhaps be objected, and with some degree of justification, that many of the photographs are almost grotesque in their reality; but no apology is really needed, as they represent the conditions exactly as we find them, and, as such, are valuable records of the surgery of this country. In some instances, the photographs, as pictures, are not as perfect as we could have wished; but they show what they are intended to represent, and, for this reason, and often without thought of their artistic merit, they have been included in the series.

To my printers and publishers I have been an unmitigated nuisance; but they have borne with me in a truly Christian spirit and have done splendidly under most difficult circumstances, lack of type, of paper, of skilled labour, all contributing. It is hard to realise that the setting has been done by Egyptian compositors, many of whom have had to 'tackle' for the first time the often highly technical English of the text; and it says much for their skill and the excellent supervision of Mr. Howard Weaver, the Manager of the Nile Mission Press, who has taken the greatest interest in the publication of the work from the beginning, that so few real errors have crept into the text.

This book has been in the making largely during the war and, in the absence of my more fortunate English colleagues on the various fronts, I have been left in sole surgical charge of the hospital; and I wish to place on record my deep appreciation of the excellent work done by my Egyptian colleagues during that time, and always; and to gratefully acknowledge their ever-willing help to me in the preparation of various parts of this book. I cannot mention them individually, they have all contributed; but it is a source of great satisfaction to me that, in the course of our twenty years association, our relations have always been of the happiest character.

Dr Ismail Diay, Assistant Surgeon to Kasr el-Ainy, has very kindly read and revised the whole of the proof-sheets, and has given me much valuable advice in many respects. He has revised with me the operative surgery appendix, and has also contributed an interesting account of the rite of circumcision as practised among the Egyptian people to the present day; and my best thanks are due to him for all he has done.

Finally, I have again to thank Dr Keatinge, the Director of the School of Medicine and of Kasr-el-Ainy Hospital, for placing the resources of the School and Hospital so unreservedly at my disposal; and it must ever be a great satisfaction to him to know and realise how much of the best part of the surgical work at Kasr-el-Ainy has been done during his association with it as its controlling spirit.

Certain sections included in this volume have already appeared in various journals and other publications elsewhere; and, among others, I have to specially thank Messrs. Cassell and Co., and the Editors of the Practitioner and of the Urologic and Cutaneous Review, for their kind permission to make further use of work published by them, with their accompanying illustrations; and throughout the text I have endeavoured to make due acknowledgments whenever it has seemed necessary.

Cairo.

March 2nd, 1919.

LIST OF PLATES.

Except when otherwise stated the photographs have been taken by myself from cases under my care in Kasr-el-Ainy hospital or in my private practice. Those initialled P.A. are included in the Pathological Album of the School of Medicine.

Fig. 5.—After-treatment of hydrocele operation; scrotum supported on scrotal shelf and an ice-bag, suspended from a cradle, resting on the scrotum. Another scrotal shelf is placed beside the patient. 340

Fig. 6.—An abdominal hydrocele. The swelling in the lower part of the abdomen extending over to the other side as far as Poupart's ligament is well seen; but the upper part is unfortunately cut off in reducing the size of the photograph.

The illustrations marked with an asterisk * are from my monograph on Bilharziosis. Cassell. 1907.

Those marked ** have appeared in the Urologic and Cutaneous Review for January 1915: and those marked *** have appeared in both publications.

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A COURSE OF OPERATIONS ON THE DEAD BODY FOR THE USE OF STUDENTS.

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I-EM-HETEP

ALSO CALLED IMHOTEP, IMOUTHES, IMHOTPOU



From an illustration in "The History of the Gods of Egypt" by E.A. Wallis Budge, M.A., Litt. D.

I-EM-HETEP ("He who comes in peace"), the most Ancient Egyptian deity of medicine and healing, was the good healer of the gods and men. There can be little doubt that he was a person who had really existed, renowned for his healing powers, who lived in the reign of Tser of the XXIst Dynasty — about 1000 B.C. — and who in the course of time was deified.

Reproduced by the Survey of Egypt 1918. (18/263).

THE SURGERY OF EGYPT.

I. SOME SPECIAL FACTORS IN THE CAUSATION OF SURGICAL DISEASES IN EGYPT.

The conditions of life and the general surroundings of the people of Egypt differ so materially from those of our more modern and polished English ideals, that it is not surprising to find certain well-recognised local factors indirectly responsible for the origin and persistence of many of the endemic diseases of this country ; and it may be well to make some general observations on these determining influences before proceeding to describe their ultimate effects, the diseases themselves.

DIRT. The Egyptian fellah, around whom much unmerited romance has been woven, lives among such appalling conditions of dirt and filth, and harbours such myriads of flies, fleas, lice, and bugs among his own personal and domestic fauna, that, by all the laws of sanitation, he ought to be inevitably doomed to all the ills that man is heir to from skin infection ; and yet, if we except the two great common plagues of bilharziosis and anchylostomiasis, he is one of the healthiest of men under ordinary conditions, and when allowed to live his own life in his own way. It is only the absence of the disease to be transmitted that saves him ; but the extraordinary rapidity of the spread of plague and other similarly conveyed diseases affords abundant evidence of the *potential* danger of his numerous parasitic carriers.

Apart from these epidemic dangers,it is only when wounds or other surgical conditions supervene, that his dirt, with all its dependents, asserts itself and the most horribly septic wounds readily result. In a country where, among the entirely illiterate and lower classes of the population, it is considered dangerous to wash a possibly syphilitic baby during its first year, lest syphilis, or any other disease, transmitted through the infected blood of the parents, may arise, one cannot expect anything else, should wounds begin to go at all wrong ; and when the original dirt is aided and abetted by ignorant *neglect* and religious *superstition*, the hopelessness of coping with the resulting condition can be fairly imagined.

Perhaps the most striking example of this neglect of treatment based upon a religious dogma is the old-fashioned view regarding the origin of syphilis. This will be again referred to in its proper place, but, briefly, the belief is held that syphilis was first given to the prophet Job (Ar. Ayoub ايوب) by God (Ar. Allah الله) as a mark of his displeasure ; and, being thus a gift of God, it must not be treated by human agency or worse evil will surely befall.

All afflictions are generally considered to have come from God, and as such are to be borne with fortitude and patience till such time as it pleases Him to remove the plague He has imposed. Such a doctrine finds full scope in the naturally phlegmatic and placid-minded Eastern races and must be held directly responsible for much of the suffering of the mass of a totally uneducated and fatalistic people.

PARASITES. With such unrivalled opportunities for development and growth it is no wonder that external parasites of all sorts and kinds flourish in full luxuriance. An Egyptian child's head infested with lice and thick with nits must be seen to be believed ; and the irritative enlargement of the cervical lymphatic glands, very frequently ending in tuberculosis, follows as a natural result.

FAVUS also grows profusely and masses of crusts, reeking of mouse-traps, present a very common picture with, later, a patchy or almost a general shiny baldness.

On the hairy scalp TINEA is not so often seen. It hardly seems to have a chance or passes unnoticed in the truly tropical parasitic vegetation.

FLEAS AND BUGS swarm in the clothes but seem to produce nothing more than a transient irritation of the skin, though they may become a very real danger in plague districts, and possibly also in the transmission of leprosy.

Most of the ordinary tropical PARASITIC SKIN DISEASES occur in Egypt and one variety at least of Oriental Sore—parasitic granuloma—caused by the presence in the deeper layers of the skin and subcutaneous tissues of the Leishman-Donovan bodies.

GUINEA-WORM and CHIGGER are common enough in the Sudan but are rarely seen in Egypt ; but MADURA FOOT is not at all unusual and seems to be increasing in frequency.

FLIES, as always, are still one of the plagues of Egypt and manifest their activities externally on many exposed wounds to which they have free and facile access. Not infrequently septic wounds are brought to hospital alive with maggots, which form great masses of wriggling life completely filling the whole septic cavity. The flies that infest and infect the eyes of small children are distressingly obvious, but are often protected from molestation and disturbance by religious scruples, as being incarnations of evil spirits whom it is dangerous to annoy.

An account of the part played by flies in the propagation and spread of typhoid and dysentery here as elsewhere hardly comes within the scope of this work, but must be mentioned if only to emphasize its very great importance in the causation of these diseases in Egypt.

Similarly, SAND FLIES, beyond the intense irritation of their sting, and in some people urticarial lesions, are more popularly known as the originators of phlebotomous fever, one of the commonest of the many varieties of fever prevalent along the valley of the Nile.

PLATE 2.



Fig 1.—Generalized favus showing the raised crateriform lesions. P.A.



Fig. 2.—Side view of the same case as in Fig. 1. P.A.

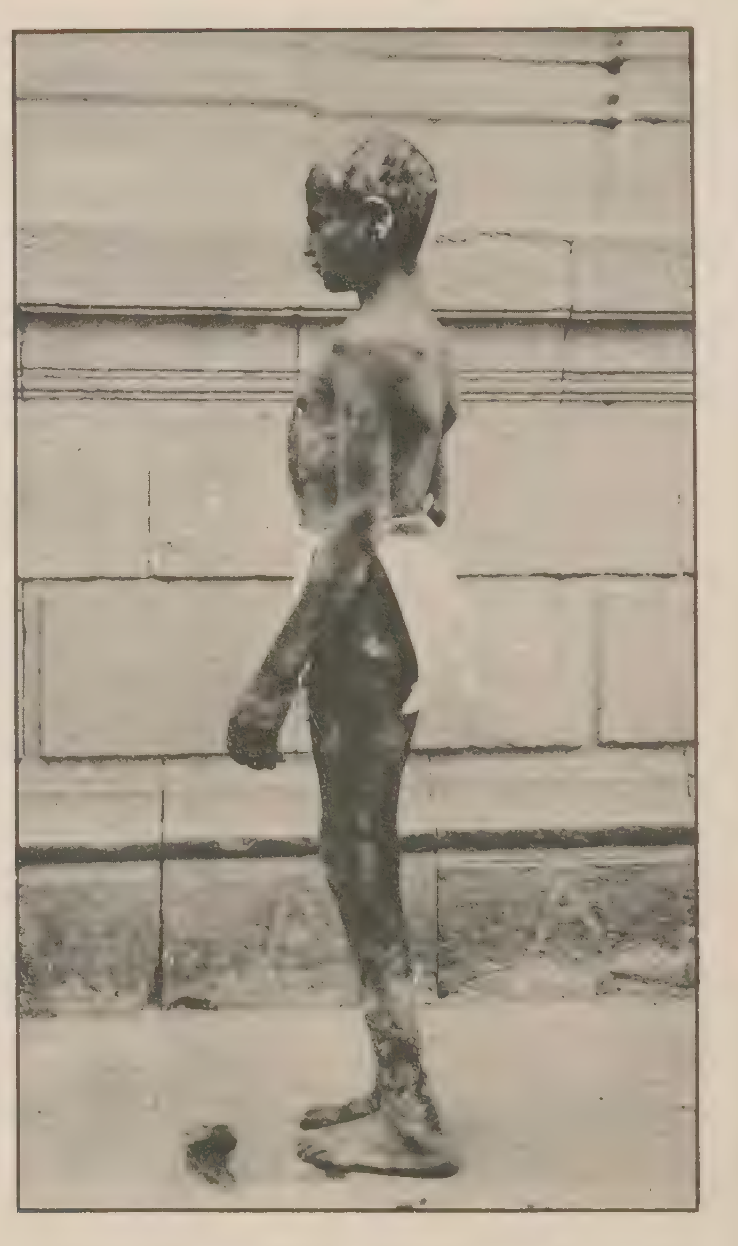


Fig. 3.—Generalized favus showing especially the dusty matting of the hair which always has a very characteristic 'mouse-trap' smell. P. A.

MOSQUITOES of various breeds abound. Fortunately they have not a good malarial field to work on, though anopheles are by no means rare. The distribution of filariasis is peculiarly limited to certain areas, mainly to certain districts of the Delta, especially round Damietta, and to some isolated villages elsewhere. A few years ago examination by Todd and White of the blood of the villagers of Kerdassah, near the Pyramids, revealed filaria in a very large proportion, both of known and unsuspected cases.

It seems probable, too, that some of the short Egyptian fevers are due to bites from a particularly persistent stegomyia, popularly known as the 'tiger' mosquito.

CLIMATIC CONDITIONS. Though Egypt is geographically a semi-tropical country it has a climate essentially its own. There are three cold, often intensely cold, months, December January and February ; followed by an uncertain March, often spoilt by the occurrence of three-day phases of hot dusty south winds. April and May are sometimes fairly cool, but can often be quite hot with frequent scorching south winds heavily laden with dust (khamseen winds). The real summer heat begins in June and lasts till the middle of October. November is usually beautifully cool and pleasant.

In the earlier summer months the heat is dry, but from the middle of July to October it may be very damp when the Nile flood is at its height. The rising of the Nile depends upon the rains in Abyssinia Central Africa and the Sudan, which come during the Indian Monsoon season, May to September.

The Egyptians generally consider midsummer as the healthiest time of the year, and, hot as the sun is, they never suffer from sunstroke. As the weather gets damper they become covered with prickly heat or suffer from crops of small boils or a general furunculosis. This combination is often aggravated by bites of multitudinous domestic insects and the generic title for the resulting condition is 'Hamm-en-Neel' (حم النيل). At this time also, and frequently among Europeans as well, NILE BOILS—a particularly acute and painful furuncular condition—are very prevalent, tetanus is more rife than at other seasons, and sepsis flourishes.

The Egyptian feels the cold intensely and on the first cold day immediately wraps up his head in a thick Bedouin shawl, leaving the body and extremities exposed as usual. He is prone to the ordinary cold, cough, bronchitis, and pneumonia, but does not suffer from chilblains or frostbite, barefooted as he often is.

Gangrene of the toes and feet is quite a common complaint in old people in the winter, and is generally due to a degenerative arterial change. A peculiar form of gangrene of the lower half or more of the scrotum appears at this season also. I can offer no very reasonable explanation for it, but can only suppose it due to infection from the soil or to pressure and cold from the scrotum resting on the cold ground when in the squatting position, which is the usual attitude of the fellaheen population when not actually at work. (1)

(1) Further investigations of this condition by Dr. Anis Bey Onsy will be noted later.

The Sudanese feel the cold of Egypt very acutely and many develop pulmonary tuberculosis from exposure to the very bleak winds, which they find particularly trying. They appear to have very little if any resisting power to the onset of surgical tuberculosis, especially of bone aud joint.

Then again, the spring, if we may so call it, during March April and May, is not considered healthy, and tetanus and boils reappear ; and in May nerves are on edge generally, sometimes resulting in an attack of "May madness" (Warnock). This corresponds to the season of the ripening of the bedingan (بدنجانة) during which, it is believed, attacks of mania are particularly likely to occur.

OCCUPATIONAL DANGERS. The special local dangers associated with the Egyptian in all grades of society, but especially in the agricultural labourers, who work in the wet and muddy fields all day and every day, are ANCHYLOSTOMIASIS and BILHARZIOSIS. The survival of the primitive custom among the people of Egypt of obeying the calls of nature whenever they feel the need of it and wherever they happen to be at the time, is responsible for a great deal of the dissemination of the latter of these diseases. The infected urine or faeces is a constant source of danger, as, in the immediate neighbourhood of the small canals, used indiscriminately for washing, urinating, defaecating, and drinking, are myriads of tiny snails, which Leiper has proved to be the secondary host of bilharzia and in which a further stage of development of this worm proceeds. This ends in the death of the snail and the liberation into the water of the now mature cercariae, which only want a skin or a mucous membrane to penetrate and so infect man or other animal, in whom the cycle of its development is to be completed. More detailed reference will be made to this subject later but it must be mentioned here as it looms so largely in the picture of occupational dangers of Egypt.

In a different way, and not perhaps essentially Egyptian, should be mentioned CAMEL BITES ; which, quite apart from the horrible mechanical destruction of soft tissues and bones, are always intensely septic and most dangerous on this account, as well as from the possibility of rabies or tetanus infected with the filth of the camel's mouth.

SCORPION STINGS must also be included, as they are often a very real danger, especially in the case of young children ; indeed, in parts of Upper Egypt, more particularly Girgeh, it is said to "rain scorpions". The Boulac quarter of Cairo is also much infected, and child mortality between three and five years is very high.

Finally, the extraordinary prevalence of RABIES among such of the domestic animals as dogs, cats, camels, horses, and donkeys, is a constant menace ; and in the country villages raids by infected pariah dogs, often quite wild, jackals and wolves, all possible carriers of infection, deserve special mention and further notice later.

II. LOCAL MODIFICATIONS IN THE COURSE AND TREATMENT OF INFLAMMATION.

Inflammation is no respecter of persons or races and manifests itself with true tropical intensity in Egypt. This severity of type may, to some extent, be ascribed to the MASKING of the familiar appearances by the general darkness and sunburn of the Egyptian skin, in which the inflammatory process may have progressed to quite a serious degree before the naked-eye changes are recognised. The colour of the Sudanese skin is coal-black ; but that of the Nubian and Egyptian races varies, from the pale black of the Berberine through all shades of browns and yellows among the fellaheen and country folk, to the pale saffron of the educated Effendi type of the town-dwelling Egyptian. The darker the skin, the less evident the inflammatory *redness* (!); indeed, one frequently meets with cases in which nothing but a shiny tenseness of the skin gives any indication of the presence of the inflammation within it. Confirmation is obtained by the local heat and the tenderness and oedema of the inflamed area. A similar shiny skin, especially of the limbs, but without swelling or tenderness, occurs in early anaesthetic leprosy and must be kept in mind.

The fellaheen's primitive and inherited TOLERANCE TO PAIN and his FATALISM, which makes him accept his burden of trouble without complaining, also explain why it is that very severe cases of inflammation and virulent sepsis are often allowed to go entirely untreated.

In other respects the actual process of inflammation and its treatment in skilled hands present no marked differences from that of European races.

The fearful sepsis that so commonly intrudes itself is fostered by the filthy HOME DRESSINGS, which are applied indiscriminately to acute and chronic conditions alike. The favourite application is a handful of wet Nile mud, ground coffee, or dung poultices. In better circles, a bread poultice is more popular. The whole flat loaf is either heated in the oven and applied dry and covered with a shawl, or it is soaked in hot water and placed directly over the inflamed part. Potato poultices are also employed. In quite the early stages leeches are extremely popular.

In CHRONIC INFLAMMATION the actual cautery has a great vogue, and blood-letting and cupping continue to be the last shot in the locker of the village barber-(surgeon).

This general BLOOD-LETTING is not usually a true venesection, but is almost invariably done either on the head or the legs. The performance on the head by an artist in his profession is a very interesting spectacle, and illustrates the unconscious adoption of certain physiological aids to promote a free and satisfactory flow of blood. The patient first has his head shaved, then sits down and pulls hard on the crossed ends of a towel or shawl looped firmly round his neck. At the same time he holds his breath and puffs out his cheeks till he becomes swollen and blue in the face, to an extent that would put a professional trombone

player to shame. With his victim in this attitude the barber makes a ring of deep incisions with a razor all round his head just above the level of the ears. From the tremendous congestion thus produced, the blood pours from the cuts in miniature torrents into the ancient barber's basin with a bite cut out from its circumference to fit closely into the neck—and continues to flow till the constricting towel is removed, which is not done till the patient is distinctly faint from the loss of blood. The bleeding head is wrapped up in the towel and the sitting is over.

The legs are bled by letting them hang and then tying a band tightly round the limb above the knee, when multiple small incisions are made with the razor, as before, all along the inner side of the leg.

It is rare indeed to find any untoward effects from these not altogether unscientific but entirely non-antiseptic methods.

In chronic inflammation, of bones and joints, in particular, a regular series of COUNTER-IRRITANT MEASURES are adopted, and frequently with very considerable success. Briefly, the commoner operations consist in first the application to the painful part of a red-hot cautery, usually an ordinary iron bar or, more often, the head of a red-hot nail, which is held with a very primitive pair of home-made forceps. The colloquial term for this direct burning treatment is 'KAI' (كيّ), and the first effects are dressed with the leaves of the castor-oil plant. Failing satisfactory relief, a seton of a thick silk thread is introduced, 'KHOUZAM' (خزام), and the loop tied loosely to allow of its easy and frequent sliding along its track. Cotton leaves are the appropriate dressing for this procedure, in which the silk is left in for several days until a good foul discharging sore is satisfactorily established. Finally an 'HUMMOOSAH' (حمصه) may be prepared by making a small cut through the skin with a razor and inserting into it a hummus bean, which is fixed in place with lemon leaves and a bandage or a piece of rag. The bean may be changed daily till a large ulcer is produced.

To clear up effusions of joints and thickenings of bone and soft tissues, vigorous MASSAGE AND FORCIBLE MOVEMENTS are practised by native bone-setters. These Barsoomahs or Maggubbereen employ methods which have come down to them in an unbroken line through generations of the one family. The Barsoomah is on much surer ground, however, in the treatment of fractures and dislocations, to the almost complete exclusion of the local medical man.

SINUS AND FISTULA. Sinus and Fistula arising from the usual English causal conditions are only too common, and in addition may frequently claim bilharzia as their cause. These latter may occur on almost any part of the skin surface, but especially in the perinaeum and for a large area around. The subcutaneous tissues of these parts are liable to be tunnelled by the bilharzial process, which has its origin in the mucous membrane of the bladder urethra or rectum. The general principles of treatment of sinus and fistula are adopted in their entirety for all varieties.

The bilharzial side of the question will be exhaustively dealt with later.

CELLULITIS. With all its opportunities for originating and spreading, cellulitis flourishes. In a country, too, where diabetes is so prevalent, the probability of a cellulitis being the beginning of, or developing into, a diabetic gangrenous cellulitis must always be remembered. This is especially liable to be the case when it occurs on the fingers or on the hand, or when it starts to spread unnaturally rapidly from a primary focus in the toes or foot. Detailed reference will be made to this condition in the section on diabetic gangrene.

An apparent cellulitis may sometimes be the beginning of a lymphangitis preliminary to elephantiasis, with elephantoid fever.

CELLULITIS OF THE SPERMATIC CORD. Syn : ENDEMIC FUNICULITIS (CASTELLANI). In the Lancet of Feb. 23rd 1907 I published a short note on this condition which, so far as I am aware, had not been previously recorded in Egypt. In the same Journal for July 4th 1908, Castellani described the same disease as occurring endemically in Ceylon, where it has been recognised for many years, and termed it "ENDEMIC FUNICULITIS". He gave a short account of its bacteriology and later, in a report on the Etiology and Pathology of Endemic Funiculitis, in the British Medical Journal for Sept. 18th 1909, described it in much more detail. Earlier in the same year D.K. Coutts, a former resident Surgical Officer of Kasr-el-Ainy, came to practically the same conclusions as Castellani and recorded his findings in the Lancet for Jan. 23rd 1909.

The description of this condition is based on these papers and on our much greater experience, both in hospital and private experience, since that time.

The *clinical picture* of the disease is very characteristic, and once seen and recognised is not easily forgotten or mistaken for anything else. It occurs specially in young adults, and even in boys just at puberty—an early event inEgypt—but it is by no means confined to them. I have seen two cases in men over 70. It is not at all a common condition in Egypt. Coutts found only 10 cases in over 13,000 admissions to Kasr-el-Ainy and the average age of the patients was 28 years.There is not generally any history of recent urethral infection of any kind, but there may be a definite past history of urethritis ; and Castellani and Coutts have both found the probable specific organism in the urethra and also in the cellulitic infiltration of the cord. Neither observer, however, considers that the urethritis is gonococcal, either clinically or on bacteriological grounds.

I have had the opportunity of seeing the disease in private patients from its very earliest stages; but in hospital practice the symptoms present on admission vary very considerably in severity.

In the mildest cases the patient complains of a feeling of weight and pain in the groin and the neck of the scrotum, and on examination one finds a tender tubular swelling, running from the testis along the course of the cord even up to the external ring. At this stage, and throughout the whole course of the disease, the vas deferens cannot be differentiated from the other structures of the spermatic cord ; but the epididymis may be thickened. as it is in the early stages of an ordinary gonorrhoeal inflammation of this structure. The testis itself is not

swollen or affected in any way, nor is the tunica vaginalis. The whole *thickness* of the cord, and very soon the whole *length* of the cord within reach is involved ; and this *general* thickening distinguishes the disease we are discussing from such conditions as varicocele, lymphatic varicocele, tubercle of the cord and epididymis, and bilharzial nodules. At this stage the temperature is hardly, if at all, raised, and the condition is, and may remain, entirely a local affection.

It is not usual, however, especially in hospital patients, to find such mild cases, and the more likely history is that of an acute inflammatory condition in one side of the scrotum—it very rarely occurs on both sides at the one time—which rapidly becomes worse and completely prostrates the patient. Such cases are admitted with fever, which rapidly assumes a septic type, and the man complains of very severe pain and dragging in the scrotum, especially when it is unsupported. Rigors are not uncommon, and on examination a very tender swollen elongated mass is felt, which can be completely encircled, and extends as a thick column right up into the inguinal canal. No line of separation can be found between the component parts of the cord, and the testicle may be felt quite unaffected at the lower end of the mass. The epididymis is usually incorporated with the lowest point of the extremely hard swelling. The skin of the affected side of the scrotum is soon red swollen and oedematous, and the pain and the tenderness all over the swollen part increase rapidly. No fluctuation can be detected along the line of the mass, which is dull on percussion and gives no impulse on coughing, nor can the swelling be reduced. At first of almost stony hardness, the mass soon becomes softer and tumid, with small softening patches in the midst of the general infiltration. In these severe cases, there is often vomiting constipation and collapse, and when these symptoms are at all marked, in conjunction with the local appearances, the picture much resembles that of strangulated hernia.

The final phase shows the whole half of the scrotum occupied by an inflamed rounded mass, which is adherent to the skin in front and runs up in one piece all along the scrotum and the inguinal canal. All the time the patient is becoming more and more septic, both generally and locally, and may even die from a general septic cellulitis of the retro-peritoneal cellular tissue or a very virulent general infection. The mortality is, however, small, except in old people, and when the enormous tension and vascular blocking of the vessels of the cord have been so prolonged as to lead to gangrene of the testis. Even then a thorough operation, which will include the complete removal of the testicle and affected cord, may give a satisfactory result. Fatal cases exhibit all the usual local and general signs and symptoms of profound septicaemia, and, naturally, the prognosis will to a large extent depend upon the general health of the patient and the efficiency and promptness of treatment. In fine, one must never lose sight of the fact that we are dealing with an essentially septic condition from the outset.

Treatment. In very early cases constant hot fomentations or antiphlogistine may be applied with great relief, and, rarely, may lead to a disappearance of the swelling. In all other cases free incision is

necessary. This incision extends from the external ring along the whole length of the swelling and divides several layers of thick infiltrated oedematous tissues, which are firmly glued together with lymph, and eventually a thick inflamed rope-like structure is exposed, which is the much infiltrated spermatic cord. On cutting into this, the veins are all thrombosed and filled with purulent clot, while the rest of the structure is thickly studded with small abscesses, or rather collections of pus, scattered throughout a spongy tissue. The vas deferens is plugged with pus and is much thickened.

In cases in which the testis is gangrenous, the wound should be still further opened up, by incising the aponeurosis of the external oblique and laying open the inguinal canal. A ligature is then placed round the cord as high up as possible, and all the parts below, testicle and all, removed. The incision may then be reduced in size by a few sutures, but the greater part of it is left widely open, packed with eusol-soaked gauze, and treated in every way like any other open septic wound.

In most cases, however, it is sufficient to open up the infiltrated cord by multiple longitudinal incisions, and then to lightly pack with gauze and apply fomentations of cyllin or eusol till the wound clears up and eventually slowly heals. A firm cord remains and the testicle is saved, though it is very donbtful if the patency of the vas is ever restored. At any rate, as Coutts suggests, the internal secretion of the testis is preserved.

Very rarely is it possible to get above the level of the disease and to find healthy cord; but should this occur we may sacrifice the testicle and perform castration, the ligature encircling the healthy cord. I do not recommend this radical treatment by castration unless the testis is gangrenous, as the less drastic measures just described are generally very successful.

Vaccines, anti-streptococcic serum, electrargol, and all the many measures for the general treatment of sepsis must be vigorously employed in all serious cases, and incisions for the opening of residual or more superficial abscesses in and around the original focus may frequently be required.

Pathology. The pathology of this condition consists essentially of a severe cellulitic infiltration of all the structures of the spermatic cord; and, in addition, a septic thrombosis of the veins of the pampiniform plexus and a somewhat similar obliteration of the canal of the vas deferens by granulation tissue, from which pus discharges into the remains of the tube. The walls of the vas are much thickened and infiltrated. Scattered throughout the dense new inflammatory tissue in the cord are many focal abscesses and areas of more diffuse suppuration. Microscopically, there is a dense mononuclear infiltration, in which are many fine new blood-vessels, of all the tissues and also of all the coats of the veins and of the vas. The lumen of the veins and the vas are filled with many pus cells. The epididymis is generally involved in the infiltration but the testis generally escapes, though the tunica vaginalis is inflamed.

In 98% of cases a diplo-streptococcus is found in the pus in the veins and in the vas. This has been found in a smaller proportion of cases in the urethra of the patients also, and Coutts suggests that the disease may be due to a secondary infection from the urethra by way of the vas. The main fact appears to be established, that the cause of this funiculitis is a streptococcus, with certain special characters, which is found in the urethra and in the vas and the veins, but its exact classification is still undetermined.

PLATE 3.

Fig. 1.—A grossly neglected tuberculous knee as it appeared on admission to hospital. P. A.

Fig. 2.—Separation of the entire tibia as a sequestrum as seen when first applying for treatment. P. A. Photo : F. King.

III. LOCAL FEATURES OF SEPTIC WOUNDS AND GENERAL SEPTIC INFECTIONS.

Practice among the poor and entirely indifferent population of Egypt alters one's ideas of the limits to which untreated local septic processes may progress, though the actual essential characters of all septic wounds remain the same. Filthy wounds, often filled with maggots, extensive spreading cellulitis, large open sores discharging stinking pus, massive necrosis of bones in the depths of heaps of redundant granulations exuding an offensive purulent discharge, and all grades of tuberculous disease gone septic, are only too common. So great is the pressure on our beds for such cases, that we have found it necessary to devote quite a large section of the surgical side of the hospital to septic admissions. In spite, however, of all this *local* sepsis, general septic infection with septicaemia and pyaemia, is not nearly so common as might be expected, and tetanus and erysipelas only claim a very small number of victims.

Chronic suppuration—especially secondary to tubercle of bone—abounds, but with it all there is a very remarkable absence of lardaceous disease in Egypt.

In considering the subject of sepsis as applied to this country, one must recall all the familiar English signs and symptoms, and then picture something many times worse in every way, before one can have a true idea of the very virulent Egyptian variety. It is largely also a question of lack of resisting power to bacillary invasion. The blacker the race the weaker the resistance, and when the primary trouble is tubercle this power of resistance approaches vanishing point. Certain new factors of peculiarly virulent characters are frequently introduced, through the medium of the filthy first dressings, such as Nile mud, ground coffee etc., or by such malign agencies as camel bites, than which nothing can possibly be more septic.

Our experience in *treatment* ranges over a very wide selection of drugs and methods, and the more important of these will now be described in detail. It must be understood that during the course of treatment such obvious measures as free incisions, drainage, adequate fixation of the part, in fact, all the general principles of treatment of septic wounds, must be most rigorously followed. Let us first insist that a septic wound must be dressed with just as much surgical cleanliness and regard to antiseptic or aseptic principles as a perfectly clean wound. Admitting that the place is already septic, our object must be to prevent it becoming more so, and to try and limit its activities by all means in our power and, especially, to avoid introducing any further sepsis.

In *recent* septic wounds, following the experience gained in the earlier days of the war (1914), pride of place was given to HYPERTONIC SALINE SOLUTIONS, and we used them with much benefit. Writing at that time I stated that they are used in 5 % solution

of sodium chloride in sterilized water with ½% of sodium citrate added. This solution may be boiled and hot fomentations are made by soaking sterilized dressings in it and changing them very frequently, never leaving them longer than every two hours. The wound may be first thoroughly irrigated out with this solution and then lightly packed with gauze soaked in it. Tablets of salt may be buried in the gauze also. A fomentation is placed over all and the dressings are kept constantly wet and frequently renewed. Large drainage tubes may be inserted into the depths and pockets of the wound and into them, at each dressing, tablets of salt may be inserted. In very bad cases continuous irrigation should be employed by means of an irrigator and tube, the flow being regulated by a clip so as to keep up a constant drip into the wound, which is itself protected by one layer of gauze. Considerable ingenuity must be exercised to prevent the fluid from flooding the bed and the patient, but, by an arrangment with mackintoshes and a bucket, this difficulty can generally be overcome, especially if it is possible to sit the patient up or to raise the head of the bed. Whenever possible, baths may be used, in which the part is soaked for an hour or two, two or three times a day, with fomentations in the intervals.

These saline applications must be steadily continued until the wound assumes a healthy granulating appearance, and the extraordinary results of this method of treatment—properly applied—must be seen to be thoroughly appreciated.

In cases of extreme sepsis, a 10 % solution of saline may be used, but the weaker strength must be substituted as soon as improvement manifests itself. In such cases, also, especially when there is a tendency to spread, injections of the 5 % solution deep into the surrounding soft parts may be made, to still further stimulate the flow of lymph from the surface of the wound and so assist the general lymphagogue effect.

Weaker saline solutions, as NORMAL SALINE SOLUTION (0.65 %) may also be used as fomentations or irrigations to a dirty wound, but have their best application as subcutaneous or intravenous injections in general septic infections.

With increasing opportunities of testing the saline treatment and other recent methods, we have been irresistibly drawn to the conclusion that, of them all, EUSOL is by far the most generally satisfactory; and we have now practically banished every other form of treatment in its favour (1917).

EUSOL was originally described by Lorrain Smith, Ritchie and Rettie in the British Medical Journal of July 24th 1915, and we have hitherto followed the method of preparation as there described. Equal parts of boracic acid and chlorinated lime make a greyish powder, which is called EUPAD. The bleaching powder must be dry and contain from 28-30 % of available chlorine. To one litre of water add 25.0 of Eupad, shake it well, and allow it to stand for an hour, and then filter. The resulting filtered solution is Eusol and contains about 0.5 % of hydrochlorous acid. The Eusol must be used warm by placing the bottle of solution in a basin of hot water to raise it to blood heat. Eusol cannot be boiled.

In the British Medical Journal of Sept. 22nd 1917, the same authors describe a simpler method in a short paper, the essential part of which is here included as its subject forms the basis of all our recent treatment of septic wounds and sepsis generally.

"EUSOL may be prepared in the following way:

"Take 135 c.cm of the B. P. liquor calcis chlorinatae; dilute with water to 1 litre, add 10 grammes of boric acid, and shake up till dissolved. The solution remains clear, and without further treatment is ready for use. If preferred, a saturated solution of boric acid may be stocked at room temperature; this contains 4 % boric acid, therefore 250 c.cm. gives the amount required for 1 litre of Eusol. In making Eusol in this way the 135 c.cm. of liquor calcis chlorinatae should be diluted to 750 c.cm. and the 250 c.cm. of boric acid solution added. This prevents the formation of the precipitate which occurs if boric acid be added to undiluted liquor calcis chlorinatae.

"By this method eusol can be prepared at a moment's notice simply by diluting and mixing two stock solutions, both of which are stable.

"Should eusol be required for intravenous injection in cases of septicaemia, it is necessary to add sodium chloride in the proportion of 8.5 grams to the litre. In this case, therefore, the 135 c.cm. of liquor calcis chlorinatae would be diluted to 500 c.cm. with distilled water, the 250 c.cm. boric acid solution added, and also a solution containing 8.5 grammes of sodium chloride dissolved in 250 c.cm. of distilled water.

"The quantities here given are calculated on a chloride of lime assaying 25 % available chlorine, which is about the average obtained from commercial samples at the present time.

"In our original paper on the preparation of Eusol we described the method of making the solution from dry bleaching powder and boric acid, and this method has been found serviceable where large quantities of the antiseptic are used and the supply has to be constantly renewed. It is less suitable where eusol is required in smaller quantities and at irregular intervals. Since liquor calcis chlorinatae keeps well, the method described above has suggested itself as a simple and convenient way of preparing eusol in any quantity desired.

"Liquor calcis chlorinatae is a 10 % solution of bleaching powder in water. It is therefore easily prepared, and its keeping power when tested has given the following results:

"In April 1915, a bottle of the solution was made by shaking up 100 grammes bleaching powder in 1 litre of water. The mixture was allowed to stand overnight and then filtered. At the time it was made it assayed 2.92 % available chlorine. It was kept in a clear glass-stoppered bottle in a cupboard in the laboratory, with temperature rising in warm weather to 18° or 20° C. Over two years later, on the last day of July 1917, the solution assayed 2.62 % available chlorine; deterioration had thus taken place very slowly. A similar solution, prepared on July 1st 1917, stored in the same cupboard during the hot weather of July has remained at constant assay during the month, namely 2.57 % available chlorine. This solution, it may be remarked, represents a very poor chloride of lime. Generally speaking, the quality of the chloride of lime manufactured has deteriorated very much during the war."

EUSOL is used in much the same way as hypertonic saline solutions, but we must briefly describe our methods in general use as the success of the treatment largely depends upon the thoroughness of its application.

Eusol fomentations. This is the commonest method and consists in the application of large thick pieces of gamgee tissue, well soaked in hot eusol solution and applied as any other fomentation, and covered with oiled paper or protective. The dressings are sterilized, the eusol is used undiluted and raised to blood-heat by the water-bath method. These fomentations must be renewed every two hours; but if it is an extensive dressing and the patient is not in a condition to stand repeated renewals, the outside wool and protective alone may be removed and hot eusol poured over the gamgee tissue to keep it constantly thoroughly saturated with the solution. In this way the fomentation used need not be completely changed for from 8-12 hours. Our general rule, however, whenever practicable, is to change the fomentations every two hours during the day and every four hours during the night.

These fomentations are continued until the wound has taken on a healthy appearance and is covered with fresh vascular granulations, on the appearance of which it must be treated as an ordinary granulating sore if it is a flat surface, or be sutured up tight if it happens to be a deep wound or flap. This secondary suture is very successful in large wounds of the scalp, septic amputation stumps, and extensive lacerated wounds generally.

If tubes have been inserted into the wounds these should be washed out with eusol and any pockets lightly packed with eusol-soaked gauze, which packs are kept constantly wet with the solution, and the fomentation over all.

Eusol packing. A dirty irregular septic wound may be packed lightly with eusol-soaked gauze, without fomentation; and this should be done also to all dirty sinuses or wounds, operative or otherwise, communicating with the mouth, urethra, rectum, or other septic cavity. Here, as elsewhere, the essential part of the eusol treatment is that the dressings should be kept constantly wet with the solution.

Eusol Irrigations. This may be done intermittently at not more than two-hourly intervals, either through tubes or directly into the wound itself; or by means of constant irrigation as already described with the hypertonic saline solution. This method is particularly useful in joint and bone wounds, and the limb must be first firmly immobilized by an appropriate splint or other appliance.

Eusol baths. In septic wounds of the extremities, septic amputation stumps, impending gangrene with cellulitis etc., the whole affected part may be placed in a eusol bath, or soaked in eusol solution in an ordinary bucket, for several hours a day. The bath is usually ordered for an hour at a time followed by fomentations, with renewal of the bath three or four times a day. (An extremely septic wound is best dressed with hot fomentations of 1-5000 PERMANGANATE OF POTASH solution for 24 hours, the fomentations being removed every four hours; or, if well covered with

a large mass of wool over a large mass of gamgee tissue and protective, the same fomentation may be left on for twenty four hours. CYLLIN powder is also very useful in extreme cases, the wound being well filled with it and eusol fomentations being placed over all.)

Eusol as Irrigating fluid. Eusol may be used to irrigate out septic cavities of all kinds from the pleural cavity to the external or even the middle ear, and is used with us to the almost entire exclusion of oxygen water. It may be used undiluted without any danger and does no harm even if it does not all return during the washing.

Eusol by Intra-venous Injection. In all cases of general septic infection, it has become part of our routine treatment to give repeated intravenous injections of a specially-prepared eusol solution. A fresh solution is made and to each 50 c.c. is added 0.50 grammes of sterile sodium chloride. 50 c.c. is sufficient for one dose and this quantity is prepared in the pharmacy and sent to the wards in a sterilized flask. The injection is done in the usual intravenous way, first passing into the vein from 50-100 c.c. of normal saline solution and then pouring the warmed eusol into the flask or funnel and allowing it to run in, as if it were a dose of salvarsan. A further 50 c.c. of normal saline is added before the eusol has all gone and the mixture allowed to run into the vein. A rigor generally follows and a sudden rise of temperature, but the results, even of one injection, are often quite surprising. The injection may be repeated every second day as necessary, the quantity of eusol solution being progressively increased to 100 c.c. and even to 150 c.c. at one dose.

Naturally in such dangerous conditions sole reliance must not be placed on eusol, but all the other measures appropriate for extreme sepsis adopted as well. Moreover, though in our experience the most efficient medicament for all forms of sepsis is eusol, it cannot be expected to act satisfactorily unless proper surgical measures are taken to ensure its entry into the depths of the infected areas. Free incisions and drainage are therefore essential factors in the successful treatment of sepsis by this method.

We have not yet seriously practised the CARREL-DAKIN TREATMENT of septic wounds, as we have found the above method more practical and more easily adapted to our own special hospital methods and nursing. Details of Carrel's method must be studied elsewhere, and there seems no question that, granted a sufficiency of skilled assistance in all the different departments, the results are wonderfully good.

Among the essentially ANTISEPTIC PREPARATIONS I confine myself almost entirely to CYLLIN, 1 in 200 for wet dressings of all kinds and 1 in 500 for baths or irrigations. It appears to be absolutely non-toxic in these strengths. In the pre-saline or eusol days it was probably the most commonly used dressing, and even now it is very frequently used on account of its convenience and efficacy in all septic wounds. In particularly filthy conditions, I pack the wound with *cyllin powder*—a mixture of boracic and cyllin—with excellent results.

OXYGEN WATER (10-12 volumes to the litre) in the proportion of 1 to 5 or more of warm water, may be most useful and best as large irrigations frequently repeated, or as a warm fomentation, with or without packing of the wound with gauze soaked in the same solution.

When for any reason it is not possible to apply constant wet dressings or irrigations, the BALSAM OF PERU preparations are of great service. This embalming method (Merciere) consists in packing the wound with gauze soaked in the following preparation:—

Guaiacol, iodoform		
and eucalyptol	āā	10.0
Balsam of Peru		30.0
Ether		100.0

This is an expensive dressing but often acts exceedingly well in cleaning up a ragged dirty cavity. It has a special value in bed sores. The dressings should be changed once or twice a day, and, if it is in any way possible, the wound should be irrigated or cleaned out with oxygen water each time. The balsam may be used also as an ointment of equal parts of balsam of Peru vaseline and lanoline. These preparations have, in my hands, almost entirely superseded Calot's various formulae.

In suitable cases the wound may be packed with gauze soaked in this solution and left without further dressing for 4 to 5 days at a time.

IODOFORM is used either as powder, with or without starch, or in the form of an emulsion with glycerine or in ether. A sterilized emulsion with glycerine is made by taking 20 c.c. of iodoform and covering it with 1-20 carbolic acid solution and leaving it to stand overnight. The carbolic is poured off in the morning. Then take 200 c.c. of glycerine in a beaker and boil it in an instrument sterilizer. Allow it to cool and then add the iodoform and shake well, stirring it also with a sterilized glass rod. This mixture is kept in a sterilized bottle and makes the usual 10 % emulsion, and is especially useful in any septic wound or sinus with a tuberculous basis. Its use in tubercle will be again referred to later. The mixture of iodoform in ether, 1-20 (5 %), should be always freshly prepared, and is of greatest value to introduce into septic or tuberculous cavities or deep sinuses. The ether rapidly evaporates and leaves a powdery film of iodoform on the raw surface of the wounds or walls of the cavity.

In septic wounds of all kinds, especially war wounds B.I.P. PASTE is becoming more and more used with sometimes extraordinary results. It was first introduced by Rutherford Morison, who has recently described the best technique of this treatment in a paper on 'the treatment of infected, especially war wounds' in the British Medical Journal of Oct. 20th 1917. The following description is largely drawn from that paper with supplementary comments from our own personal experience of this method.

The principles of the treatment consist in thorough cleaning of the surrounding skin with 1 in 20 carbolic lotion and of the wound with alcohol, after which Bipp is very thoroughly applied to the surfaces of the wound itself according to a very careful technique.

The paste is *prepared* by taking 1 part of bismuth subnitrate and 2 parts of iodoform and rubbing them into a paste in a mortar with 1 part of liquid paraffin. The paste is then rubbed down on a slab with a spatula in small quantities at a time to make it quite smooth and free from gritty pieces. The paste may be sterilized and put up in soft metal tubes for field use.

We may best illustrate the use of Bipp by describing the technique to be followed in different septic conditions. Thus in the case of a *lacerated, flap, or open wound,* the patient is first anaesthetized and all the surrounding skin thoroughly cleaned with 1 in 20 carbolic lotion. The wound is then thoroughly opened up, all the pus and discharge mopped out with sterile gauze, sloughs cut away, all foreign bodies, pieces of bone or old blood clot, removed, with spoons scissors or swabs as may be necessary, and the entire depths of the wound widely exposed. The whole raw surface and cavity is then filled with alcohol- methylated spirit—and thoroughly rubbed and cleaned with gauze soaked in alcohol. The gloved finger protected with gauze is the best instrument for this cleaning and also for the subsequent application of the Bipp. After drying out the wound with sterile gauze its whole extent is now rubbed well with Bipp, which is thus freely applied to every part of the septic area. The excess is then wiped away with dry gauze and the wound sutured with silk sutures, inserted well away from the edge and well rubbed through Bipp first, by drawing them through a fold of gauze smeared with the paste held firmly between the fingers. Several interrupted sutures are inserted. The wound must not be too accurately closed but spaces left between the sutures. The surrounding skin is then cleaned with alcohol and a dressing of Bipp spread on gauze placed over the wound. Another piece of alcohol-soaked gauze is placed over this and then wool and bandage. Such a dressing is left untouched for 4—5 days. The wound is then dressed, any discharge and Bipp there may be wiped away with alcohol gauze, and a fresh Bipp dressing applied as before. After the first dressing the wound may be dressed every few days until very soon a simple dry dressing is all that is necessary.

In the case of old *chronic septic wounds* the skin and thickened soft tissues beneath it may be completely excised before the Bipping is done.

Much of the discharge at the first dressing is not really pus but altered Bipp and the wound must not be opened up on this account even though there may be some temperature.

The same principles are followed in the case of *compound fractures, and necrosis of bone,* with or without sequestrotomy, and in these conditions a very important part of the treatment is rest and perfect fixation of the fragments.

It may be impossible to close the wound in these and in other wounds associated with much loss of skin, in which case, after wiping away the excess of Bipp, a dry packing of sterile gauze may be applied and the dressing left unchanged for 4-5 days. At the subsequent dressings the wound may be lightly packed with gauze well smeared with Bipp.

A through-and-through wound with small entrance and exit openings may be generally cleansed satisfactorily by passing a long

strip of gauze through it and pulling this to and fro as a first step; next by doing the same with a strip of spirit gauze; and finally depositing a layer of Bipp on the inner surface of the wound, by spreading a long strip of gauze with Bipp, passing it through the track and rubbing in the paste by pulling the gauze backwards and forwards again and again.

A sinus or a residual pocket may be packed with Bipp gauze and thus dressed every two or three days.

The drier a wound can be made the better, but some haemorrhagic oozing does not bar success. The fresher the wounds the better they react to Bipp treatment, and the essential feature of this method of treatment is to close the wound, without tube or other drainage than is allowed for between interrupted sutures not too close together. The sutures should be left in for two or three weeks.

One of the most valuable applications of this treatment is in the case of *septic knee joints,* particularly from gunshot wounds, and, as further experience tends to show that the results of this procedure are better than any other, Rutherford Morison's description of the necessary technique will be here included.

"The subsequent fixation of the joint is all-important, so an extension strapping or glue dressing is first applied below the knee. The skin surrounding the wound is then disinfected with 1 in 20 carbolic and also all the skin on the anterior surface of the joint. A tourniquet is then applied, after the blood has been drained from the limb as far as possible by elevating it for a few minutes. The limb is put down and the whole operation area around the knee surrounded with sterilized towels, as for any other operation on the knee and with just as much aseptic care. The joint is now opened through a horseshoe-shaped incision, dividing the ligamentum patellae and the musculo-aponeurotic structures on each side of the joint, but avoiding damage to the lateral ligaments on either. The patella is then turned upwards exposing the joint and subcrural pouch. Any discharge is then mopped out very gently—not scrubbed or wiped—with dry sterile gauze: and on further flexing the joint the posterior part of the joint is similarly cleaned. Now gradually extend the joint, fill it with alcohol, and gently mop it dry. Remove the tourniquet, with the limb elevated to a right angle; and keep it there, with the joint compressed under gauze pads, for four minutes. Then clamp any bleeding points with Lane's haemostatic forceps. Rub a thin layer of Bipp over the whole joint surface with gauze on the gloved index finger. After this has been thoroughly done and all bleeding has ceased, the ligamentum patella is sutured with strong mattress sutures and the remainder of the deep incision with interrupted sutures, both of catgut; and then the skin is closed with interrupted sutures of thick silk rubbed through with Bipp. Dress the wound with gauze wrung out of alcohol and then abundant cotton wool, but no bandage. Finally fix the limb with two Gooch splints or lateral plaster splints, from the perinaeum to the sole, and fix firmly with a bandage, and also with plaster bandages above and below the knee and above the ankle. When the patient is back in bed apply a weight of 6 kilos for continuous extension."

The dressing should not be touched for three weeks. It takes courage to wait so long in spite of temperature, and sometimes evidences

of iodoform poisoning, but the results fully justify it, though the first dressing sometimes looks very bad, as a lot of slimy secretion is generally exuded and the outlook appears anything but promising. The discharge must be wiped away with an alcohol swab, and the dressing done with alcohol-soaked gauze as before and renewed every three or four days. As soon as the wound has well healed massage and passive movement must be commenced and the results are sometimes little short of marvellous. At the first dressing the joint is usually perfectly flat without any sign of inflammation in it and certainly no fluid.

Any injury to the bone, and the entrance and exit wounds, must be carefully treated in the Bipp way at the same time.

Bipp has also proved very successful in cases of *gunshot wounds of the chest,* in which it has been left in the pleural cavity after thorough cleansing of it, excision of a rib, excision of the wounds, and complete closure of the chest cavity.

When a septic wound is clearing up, the best dressing is CYANIDE GAUZE, soaked in cyllin solution or in 1-40 carbolic. This dressing is made by impregnating the gauze with a 3-5 % of the double cyanide of mercury and zinc. Properly used, it is probably the best of all the purely antiseptic dressings. It is of value also when sterilized and used dry. In all cases of mild superficial sepsis, the routine treatment is to paint the whole wound and its surroundings with a 2 % solution of IODINE in rectified spirit, and then cover with dry cyanide gauze.

As a ragged septic wound begins to heal, the granulations frequently are excessive, and the surface must be stimulated by the application of SILVER NITRATE or PURE CARBOLIC and then dusted with a drying powder, such as ARISTOL and STARCH (1-5) or with lint or gauze soaked in RED LOTION. This latter is often exceedingly useful and has the following formula :—

Sulphate of zinc	0.15	
Tincture of lavender	1.00	
Water to	30.00	i.e. a 1-200 solution.

The lint must be carefully cut to fit the size of the granulating wound and covered with a piece of oiled silk or protective and then with dressing. As a preliminary dressing, before grafting directly on to a granulating wound, red lotion is almost indispensable.

To stimulate the growth of epithelium from the margins of a healing wound, nothing is better than SCARLET RED in the form of a 5 % ointment in vaseline. The skin all round the healing margin must be smeared with vaseline and the scarlet red ointment spread on narrow strips of lint, which are placed on the margin of the sore, half of the width on the vaselined skin and half on the granulating surface. The effects are sometimes little short of marvellous ; and to see a large raw surface rapidly skin over from its margins is quite an extraordinary sight. A 2 % solution of ETHER in water, in which lint is soaked, also acts very satisfactorily, both in stimulating granulations and the growth of epithelium. PICRIC ACID, in 1 % watery solution, has also a good effect, but is more effective in larger more superficial wounds in which small islets of epithelium are undestroyed in the midst of the burnt

or ulcerated area. The picric acid dressing is applied as soaked lint which covers the whole area and is changed at long intervals, certainly not oftener than once a day.

SKIN GRAFTING requires no special description; but in our experience the best dressing for the applied grafts is a dressing of plain sterilized gauze kept constantly wet with normal saline solution till the first dressing, forty-eight hours after the grafts have been applied. Once the grafts show signs of adhering, sterilized vaseline is applied on gauze, and thenceforward the grafted area is treated like any other healthy healing wound.

The GENERAL TREATMENT of sepsis, whether there is a general blood infection or not, is carried out rigidly on the usual well-established principles ; but, in addition, there must be described certain routine special methods which we find necessary to adopt in the presence of our particularly virulent type of infection.

Thus, all cases are given a full dose of ANTI-TETANIC SERUM subcutaneously, the dose and quantity varying with the particular form of serum available.

A course of VACCINES is regularly ordered, starting with 100 millions of stock staphylococcus vaccine and 5 millions of streptococcus. In five days' time the second injection of 500 millions and 20 millions respectively is given and, after a similar interval, 1000 millions and 20 millions. Further injections may be given, but, generally, if no benefit has already resulted, no *stock* vaccine can be expected to produce any further effect.

Autogenous vaccines may then be made, but are not often necessary, except in very chronic cases, and should then be steadily persevered with so long as consecutive reaction is produced.

Of TUBERCULIN injections, with or without vaccines, I have no experience as, unfortunately, our cases are mixed infections and are so advanced, that they require a more forceful method of treatment, if, indeed, they react to anything.

In the intervals between the vaccine injections ANTI-STREPTOCOCCIC SERUM may be tried in severe cases, and I have sometimes seen marked improvement follow its use. 10-20 c. c. should be injected at a time, preferably at bed-time, and the serum acts best if given intravenously.

Another remedy to be tried is ELECTRARGOL, one of the colloid silver salts, injected deeply into the subcutaneous tissues or muscles, twice a day. Similarly LANTOL, in doses of 3 c. c., by subcutaneous injection twice a day, may be of service; and this drug may also be given by mouth, as tablets, three or four times a day.

In extreme cases large quantities of warm NORMAL SALINE SOLUTION may be introduced into the veins with good effect ; and as has already been described, EUSOL, in a special saline solution, may be used in the same way and often with great benefit.

In few other conditions is there such great need for constant watchfulness as in a septic infection, the timely opening of an insidious pocket frequently altering the whole course of the case and rapidly bringing it to a triumphant conclusion.

IV. ULCERATION AND SPECIAL ULCERS.

It is the invariable custom of the fellaheen population, both male and female, to go about bare-footed, with the exception of a loose flat heel-less shoe, which is slipped on for walking along the road or about the village. In the fields the men work in a galabeah or with a pair of linen drawers tightly rolled up round the upper parts of the thighs and crutch. From exposure to the sun and the constant wet of the irrigated fields, the skin, particularly of the legs, becomes burnt almost black; and the soles of the feet, especially the heels, become enormously thickened, hard, horny, and cracked. Ulceration may sometimes occur deep in the crevices and be very troublesome to heal; but the legs themselves remain extraordinarily free of ulcerations, even though they must very often receive quite severe cuts and other injuries during work, from the only agricultural-digging instrument at all in common use, the fass, which is exactly like a blunt adze.

SIMPLE ULCER and healing sores are not uncommon, but CHRONIC ULCER OF THE LEGS and all varieties of it are remarkably seldom seen. Varicose veins are very rare among native Egyptians, so that the risks and consequences of chronic congestion do not occur. So rare, indeed, is chronic ulcer, that syphilis is always suspected as the cause of any old-standing ulceration on the legs or elsewhere.

EPITHELIOMA is very prone to develop on any chronic ulcer of the legs in a larger proportion of cases than in Europe, with or without a syphilitic basis.

Whenever possible, cases of CHRONIC ULCER are admitted to hospital and given rest in the elevated position and repeated eusol fomentations; and then the ulcerated area is completely excised and grafted by Thiersch's method, either at once or when granulations appear on the raw surface. When, for any reason, operation is not possible - which must occur in very few cases as the operation may be done under local anaesthesia - the ulcer may be tempted to heal by dressing it, after it has had a course of eusol fomentations, with red lotion and scarlet red. I have had very successful results also in transplanting a graft of the whole thickness of the skin into the raw wound left after the excision of the ulcer. The skin may be taken from the chest and must accurately fit, and may be fixed in position by a few catgut sutures. The superficial layers of such a graft always die and become black, but this does not mean the graft has failed, as, generally, the deeper parts adhere quite firmly.

In out-patient practice, an attempt must be made to support the part with silica bandages with a window, and to clean up the ulcer itself with eusol, and later dress it with red lotion and scarlet red. Anything like a satisfactory result is hardly to be expected, if the patient has to walk when under treatment.

With these reservations, ulceration, in symptoms and treatment, does not differ from English practice.

PERFORATING ULCER. This is the name given to a peculiar round deep ulcer, often quite painless, which occurs on the sole of the foot, most commonly under the ball of the great toe, but also, though less frequently,

on the heel or even on the side of the foot. It is said to start sometimes as an abscess in connection with a corn or callosity, but this is not the case in Egypt, where corns and tight boots do not trouble the average unspoilt native Egyptian. It may, however, and probably often does, begin with a prick from or lodgement of a thorn, or piece of wood or stone. This gives rise to an abscess, which eventually bursts and leaves a deep track which never has a chance to heal. When first seen, it is already a deep punched-out quite un-healing and unhealthy ulcer, in the usual situation, which proceeds to extend more deeply and may penetrate to the underlying bone or open into the joint, especially the meta-tarso-phalangeal joint of the great toe. In extreme cases considerable destruction of bones and joints is produced, much more than appears from a casual examination of the ulcer itself. The average-sized ulcer discharges a thin sero-pus and has sharply-cut margins, with much thickened and sodden epithelium all round it. A bunch of unhealthy granulations may project from the ulcer, which may sometimes become extremely septic and spread, with much surrounding cellulitis of soft parts, or an extensive necrosis of the bones of the foot, especially of the os calcis or the first metatarsal. The whole foot may be oedematous and inflamed without much, if any, pain; indeed, very often, the parts immediately surrounding the ulcer may be quite anaesthetic.

Many cases are *trophic* in origin, using the word in its widest sense and embracing any disturbance of nervous function from a peripheral neuritis to serious nervous disease, and, especially, locomotor ataxia. In this event, the ulcer tends to deepen rapidly and to spread widely by a kind of deliquescing process or a feeble non-reactive inflammation. These trophic ulcers are frequently associated with other trophic manifestations, especially Charcot's joints. Similar trophic ulcers may be leprous or diabetic in origin, in the latter case arterio-sclerosis contributing considerably to the causation of the condition. The usual ending of these arterial-degeneration ulcers is gangrene, whether primarily diabetic or syphilitic in origin. This question will be again dealt with in the section on gangrene. (A good description of perforating ulcer is given in Da Costa's Surgery).

The ulcer may also start in a deep crevice in the sole of the foot of one who is accustomed to walk and work in bare feet, and who is also liable to pick up a piece of wood or thorn which may give rise to a primary abscess. In either of these ways originates the PILGRIM'S ULCER, though many a perforating ulcer occurs in a foot that has never travelled near the Holy places of the pilgrimage.

The *treatment* of perforating ulcer is essentially that of its cause with, in addition, if it is possible either on general or local grounds, complete excision of the ulcer. Eusol or other antiseptic fomentations should first be applied, or, better, the foot soaked in a bath for several hours at a time. The operation for excising the ulcer may necessitate the removal of bone and, indeed, in some cases resolves itself into an extensive removal of necrosed bone or bones. Severe cases may require amputation of the toes, or even of the foot, to effect a cure. One must not be frightened by the name but must treat the condition in every way, both locally and generally, as a chronic deep ulcer demands.

BILHARZIAL ULCERS. The characteristic feature of bilharzial destruction in *mucous membrane* generally consists in the slow molecular disintegration of the surface epithelium, brought about by the crowding of the sub-mucous tissues with multitudes of ova. Deeper in the connective tissue of the wall of the affected organ an irritative round-celled infiltration occurs. This leads to the formation of a firm fibrous tissue, and also to a soft unhealthy granulation tissue in the deeper parts of the sub-mucous layer. This latter may also persist as the lining membranc of fistulae which may form tortuous tracks through the fibrous tissue.

A precisely similar pathological change may occur in the *subcutaneous* tissues. Ova become deposited, especially in the perinaeum, but also in the ' bathing-drawers are a' and, rarely, elsewhere, and give rise to fibrous nodules. The earlier appearances of such deposits are very similar to tuberculous subcutaneous nodules. These nodules, or chain or irregular collection of nodules, are at first hard, then gradually enlarge and soften, and ultimately burst through the skin and discharge a thick dirty cheesy material and persist as a sinus, or as a fistula in more or less free communication with an adjacent organ or mucous surface.

One may see all stages in the process, from a single, or several, shallow punched-out ulcers, with irregular worm-eaten margins, to a dense mass of chronically-thickened skin and subcutaneous tissues, pierced in all directions by multiple fistulae, lined with soft granular tissue and exuding urine or faeces and a thin yellowish sero-purulent discharge. The essential part of the discharge, however, consists of epithelial and granular debris variously changed by the degree of septic infection also present.

If this condition is seen when it is still in an early stage of ulceration, the individual ulcers will be shallow irregular trenches with ragged edges and without granulations; and rather later they are separated from the surrounding tissues by a thin fibrous wall all round.

The diagnosis in most cases can only be suspected from the presence of bilharzia in the adjoining parts and the characteristics just enumerated; and the treatment consists in complete excision of the ulcers themselves, which generally forms part of the radical operation for the removal of the original focus of the disease in an adjoining organ.

DIFFUSE PAPILLOMATOSIS OF THE PERINAEUM AND PUDENDA. The condition with a somewhat unwieldy name which I am about to describe appears to be related, on the one hand, to that class of obviously parasitic new growths, in which, so far, only spirochaetes of various sizes and characters have been found; and, on the other, to the more clearly defined lesions due to the presence of Leishmania tropica, which we recognise now in Egypt under the term of "parasitic granuloma".

It is included in this place as it sometimes occurs with bilharziosis of the male urethra, the vulva, or the rectum; and, assuming for the moment that it is a spirochaetic infection, Ferguson conceives first the infection of the filthy discharge, coming from the bilharzial fistulae or ulceration, with spirochaetes. These spirochaetes in the discharge, which is constantly bathing the skin of the perinaeum or other neighbouring parts, eventually gain an entrance through the sodden skin, or irritate it

from without, and ultimately start the well-known papillomatous condition, which tends to increase in size from the constant presence of the original irritant and by local extension or auto-infection.

With this as a working supposition further investigations are being made, the results of which it is hoped will be included in this volume.

I have a typical case before me as I write, and its description will serve to illustrate all the essential features of the condition. The patient is a man of middle age, an Egyptian fellah, with severe urethral bilharziosis, which is manifesting itself externally in a series of deep fistulae, occupying the left side of his scrotum and discharging a dirty purulent and urinous fluid. This discharge has rendered the lower part of his scrotum sodden and somewhat excoriated, and has marked out a broad wet track in the perinaeum, leading through a wide roughly quadrilateral area of warty excrescences lying across the perinaeum and extending outwards as far as the tubera ischii and down to the anus behind. The general appearance of this area is that of a raised plateau, on which is thickly and irregularly sown a multitude of hard dark-brown pear-shaped warts very closely studded together. In the central portion of the square, the papillomata are wet, sodden and swollen ; and debris of epithelial cells, dirt, decomposing urine and pus, fills in the crevices between the excrescences. Here, too, there is some erosion of the papillomata and a tendency to superficial ulceration and cracks, which end in ulcers in the skin of the plateau which bears the warty growths. The smell is very unpleasant, both from the decomposition of the discharge and the accompanying sepsis. At the margins of the area the papillomata are smaller, dry and firm, and are evidently newer than the central ones. Spread is certainly taking place at these margins, but is very slow owing to the essentially chronic formation of such hard epithelial outgrowths.

The condition is quite painless except from the ulceration and cracking, and especially when this has involved the margin of the anal canal.

One must look on the case we have just described as diffuse papillomatosis of the perinaeum, occurring in a patient suffering from bilharziosis in one of the adjoining mucous membranes ; and, almost certainly, as an instance of secondary spirochaetic infection of the purulent discharge.

But precisely the same condition may occur in the same places, and especially in women, *without any bilharziosis.* So far as I have seen it, this form spreads much more extensively and widely, and the individual papillomata are not so large, but there is more degeneration of them and consequently ulceration is more marked. Moreover, occurring as they do in such moist parts and in a tropical country, the accumulation of sweat, epithelial scales and debris generally, is even more plentiful, and the odour and the cracking in the crevices more marked. In a well-marked case in a female, these appearances may extend from well behind the anus to involve the whole perinaeum, extend laterally on to the buttocks,completely invest the whole vaginal outlet, and spread on to the lower part of the abdomen over the symphysis pubis. In men also the greater part of the scrotum may be affected, and the disease may even spread forward on to the base and body of the penis and outwards over the groins.

PLATE 4.



Fig. 1.--Diffuse papillomatosis of perinaeum due to spirochaetosis. P.A.



Fig. 2.—A similar condition secondary to bilharzial urethral fistulae. See text.

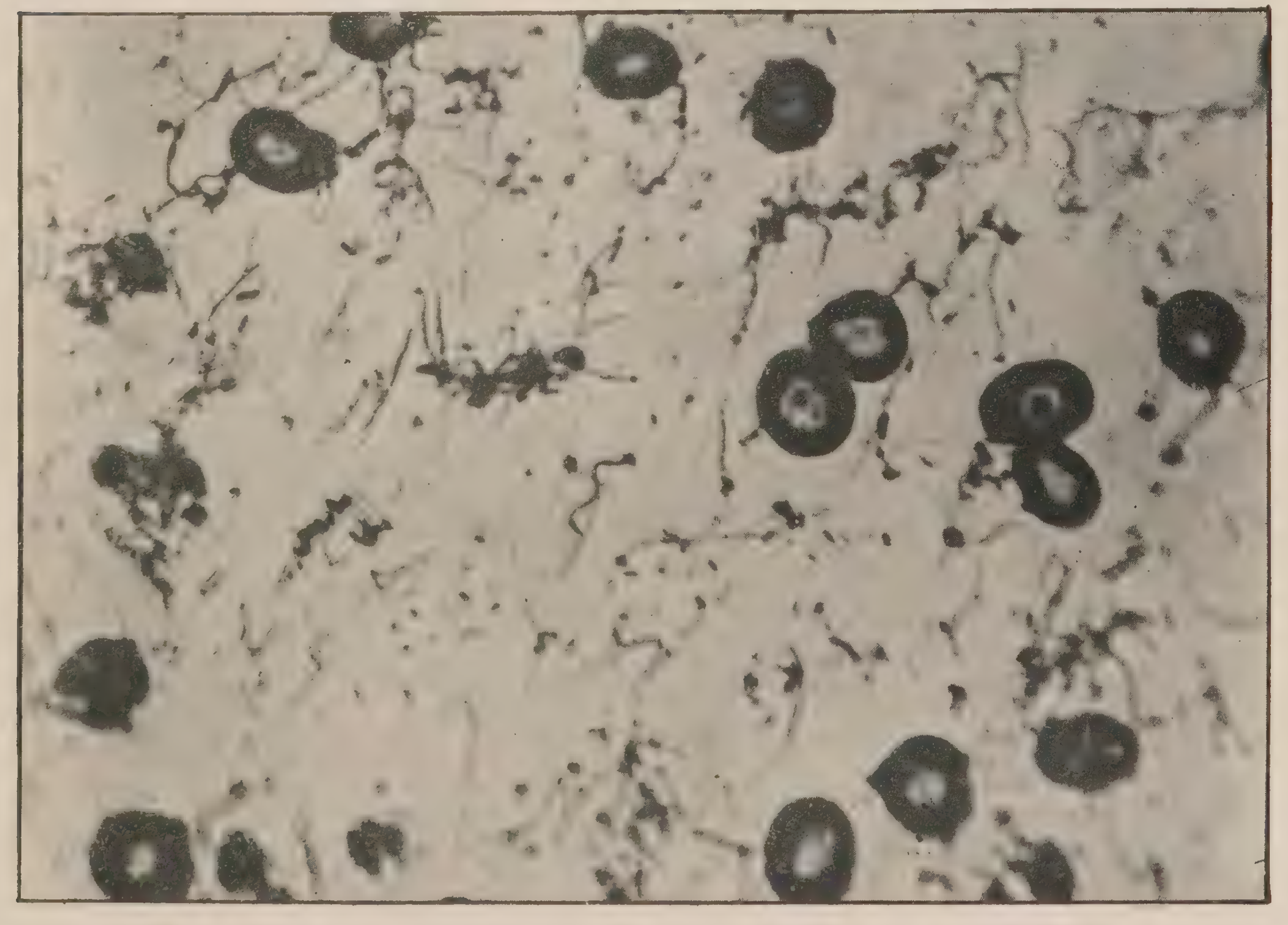


Fig. 3.—Microphotograph of spirochaetes found in the above conditions. The best spirilla are seen in the lower part of the field to the left. Photo : Dr. Anis Bey Onsy.

These non-bilharzial cases must, I think, be considered primary and exclusive spirochaetic infections; and Ferguson has found many varieties of spirilla in the substance of the growth and in the debris between the growths, together with numerous staphylococci and other septic organisms from the skin surface, with the intercurrent sepsis.

Though these conditions bear a superficial resemblance to the *ulcerating granuloma of the pudenda,* which occurs in mid-tropical countries, and is described in detail in Manson's Tropical Diseases, 5th. ed., page 661, I do not think they are the same disease. This particular affection I have never seen in Egypt, and from its description it appears to be more closely allied to the parasitic granulomata produced by Leishmania parasites, one of which will be described in a following section.

The only *treatment* of all forms of warty masses included in the above descriptions is complete excision; followed by plastic operations and grafting, after one is certain that all the infected tissue has been completely removed.

GRANULOMA LABIALIS. We have not yet exhausted the varieties of disease, either directly or indirectly traceable to a spirochaetic infection.

Within the last few years I have seen several cases of a peculiar destruction of the lips, which I long ago labelled pseudo-epithelioma. Sections of the growing or deliquescing edge of these cases, made for me by Dr. Anis Bey Onsy, Assistant Professor of Pathology, show that the whole mass is essentially a very cellular granuloma, without any epithelial down-growth or deep invasion, and very indistinctly delimited from the deeper tissues. The epithelium is evidently destroyed by the excessive accumulation of small round cells in and between the cells. The change is comparable to that in the middle of a syphilitic gumma before degeneration has begun. In two or three cases a long spirochaete has been found in the substance of the granulomatous tissue and, superficially, the usual flora common to all surface ulcerations. No Leishmania parasites have been discovered.

This disease occurs most frequently on the lower lip; but, rarely, the upper lip may be the primary site of infection. In certain cases both lips are involved, generally as a result of extension from the lower.

I have not seen the very early stages of the condition, unless we can consider certain circumscribed swellings involving the lip margin and extending into the whole thickness of the lip as its pre-ulcerative stage. When the patient first comes under observation—it is much commoner in men than in women—there is a deep excavated ulcer of the lip, looking at first sight like an epithelioma. But a closer examination shows that the edges, though raised and rolled out, are not hard; there is no induration, either beyond the margins or at the base; and there are no secondary enlarged lymphatic glands under the chin or in the neck, unless they occur as large rapidly-softening isolated glands which soon suppurate and form an abscess. The growth is very chronic and the epithelial margin of the lip involved in the ulceration is destroyed and its place taken by a soft granular friable tissue, while the growing edge may have a fungating appearance. At a later stage, destruction of the diseased tissue goes on apace and large portions of the lip disappear, as though they have been

melted off, leaving very often a sharply-cut edge surrounding the whole extent of the ulcerated area, or deep crater-like cavities with ragged sides. Though the nature of these cases may be suspected, the diagnosis can only be made absolute by a microscopical examination of a portion of the margin of the ulcerated area. This is particularly necessary as the most likely cases not infrequently show undoubted epitheliomatous appearances, in spite of the slow progress of the disease and the peculiar deliquescent nature of the destruction of tissue. Series of sections are now being made to ascertain whether such cases are not really secondary epitheliomata engrafted on to a primary spirochaetic or other form of granuloma.

The pathological findings entirely control the nature and extent of the necessary operation; a free excision wide of the growth being all that is necessary for granuloma, while a very complete radical removal of growth and glands must be carried out for epithelioma. In either case appropriate plastic operations for the re-modelling of the lip are to be devised, either as part of the original operation or later.

As in all chronic ulcerations of the lips, the differential diagnosis on clinical grounds must be carefully made from all the more common diseases affecting this region, and especially must care be taken to eliminate the various forms of syphilitic disease, so common here and yet so often missed.

These granuloma ulcerations occur rarely in other parts of the body, but great caution must be observed in their diagnosis, as it can only be confirmed after the exclusion of syphilis, tubercle, and epithelioma.

PARASITIC GRANULOMA (Syn. Egyptian Oriental Sore). For many years I have been familiar with certain peculiar primary papillomatous masses, occurring on the exposed parts of the skin surface, almost like areas of mis-placed and dry venereal warts ; and have had sections examined for me by Professor Symmers and others, but we did not succeed in finding the organism responsible for the granulomatous tissue and epithelial overgrowth, of which the mass consists.

Later investigations, however, have proved more productive of results ; and it was left to my colleagues, Ferguson and Richards, to definitely elucidate the problem and put the condition in its proper category.

Their results were published in the Annals of Tropical Medicine and Parasitology, Vol. IV. No 2. July 1910, under the title of " Parasitic Granuloma, a condition allied to Oriental Sore occurring in Egypt" ; and I cannot do better than quote largely from this article, with a running commentary including my own personal experience of the condition.

In general terms, the disease occurs as hard, raised, warty masses on the exposed parts of the skin surface, especially the limbs, sharply delimited from the surrounding skin and slowly increasing in size and number. These masses ultimately soften, and dirty broken areas are formed in the substance of the mass, and ulceration occurs in the cracks

PLATE 5.

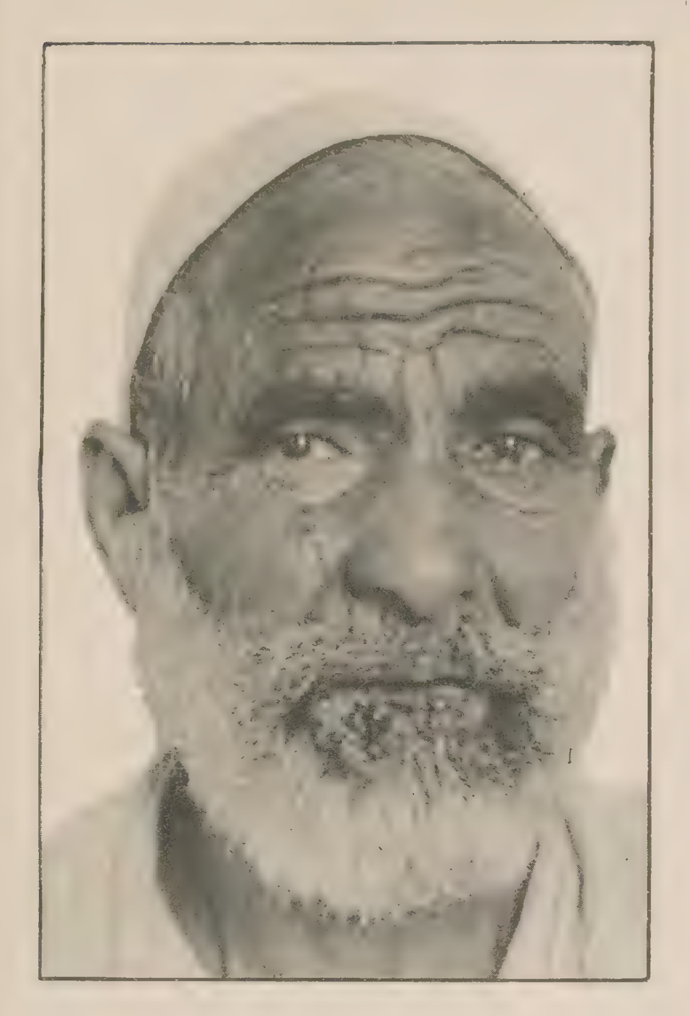


Fig. 1.—Granuloma labialis of the lower lip. P.A.

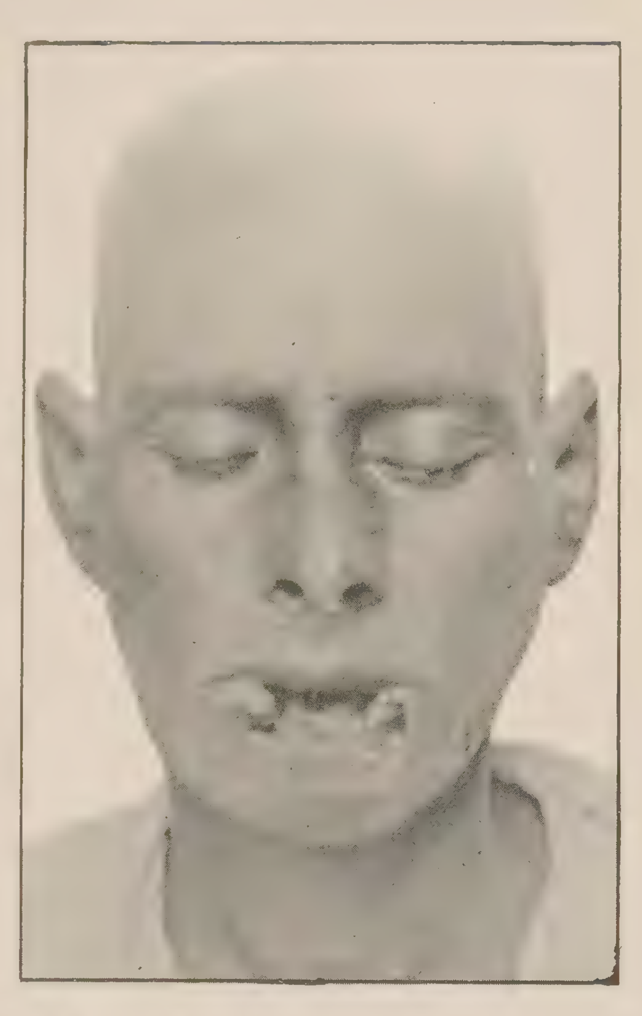


Fig. 2.—A later stage of the same condition. P.A.



Fig. 3.—An advanced case of granuloma labialis starting in the middle of the upper lip. P.A.



Fig. 4.—A later case in a woman which had become epitheliomatous. Photo : F. King.

and crevices between the groups of papillomata. Other drier patches 'ook not unlike massive psoriasis, but without its glistening surface.

Two forms of this condition can be distinguished. The *warty*, which is by far the most common, and structurally is a papilloma; and a *flat* form, which consists of a raised flat skin-covered granuloma. In both varieties Leishmania tropica bodies occur, and are specially numerous in the flat form.

The condition is generally found among the poorer, bare-footed population, at almost any age from eighteen upwards, and is seen much more often in men than in women, in whom it is decidedly rare, though I have recently seen a very typical and fairly advanced case about the ankles and feet of quite a young woman.

The progress is very slow, but it tends to increase in size and also to infect neighbouring parts by auto-infection from scratching. Though the patches may be extensive and multiple, it is entirely a local affection and does not interfere with the general health of the patient.

Of ten cases Richards reports, five were affected on the forearm or hand, four on the legs and feet, and one on the face. Half of them had single lesions, half multiple. The duration of the disease varied from six weeks to ten years, averaging six months.

Infection almost certainly takes place through the skin, for it appears almost exclusively on uncovered parts, that is, on the limbs and face rather than the trunk.

(*1*) *Warty form.* Richards describes this variety as follows:— "These masses begin as small painless tubercles,and may gradually attain a diameter of three or four inches. The skin round their edge is usually healthy, but it may be reddened from sepsis, or show a definite areola marked by loss or increase of pigment. They have a very definite raised, even overhanging, edge and may rise nearly an inch abruptly from the level of the surrounding skin. The surface of the growth by the time it is seen is often ulcerated in whole or part; but, typically, is covered by hard whitish epithelium and presents a warty cauliflower-like appearance. It is intersected with clefts lined with foul decomposing epidermis; indeed, where bacterial infection has occurred, it is possible to express masses of dead epithelium with pus from the numerous apertures under the overhanging edge. In places where movements naturally take place, as on the front of the ankle, some of the clefts deepen and appear as transverse fissures, which extend through the skin and give rise to pain on movement. With this exception the disease appears to be painless. There is occasionally some local oedema and enlargement of lymphatic glands, but these depend on secondary sepsis and are not an essential part of the disease. Most of the growths become septic in course of time and full of mixed infection. Most of their offensive smell and foul appearance is due, however, to decomposition of epithelial masses on the surface and in the clefts, outside the substance of the growths altogether. If they could be kept clean, which, of course, they never are, they would probably show a firm white mamillated surface, like the head of a raw cauliflower, to sight and touch."

"A very striking feature, and one which marks them off at once from malignant growths, is the way in which they are confined to the skin and hardly ever affect even the most superficial tendons. An extensive growth on the dorsum of the foot scarcely affected the movement of the extensors of the toes; and it is quite easy, after running an incision round them, to strip them like a scalp off the deep fascia, leaving a smooth surface on which grafts take readily.

Exceptionally, the growth may extend more deeply and envelop a nerve but it shows no tendency to infiltrate its substance." (I have also seen it infiltrating the tendon sheaths about the ankle.)

(2) *Flat form.* To quote Richards again:—"So far we have only seen two instances of this variety, and they both occurred in students of the higher schools, one on the face and one on the forearm, and had been present for four and twelve months respectively. They were flat, pink patches, raised one or two millimetres above the surrounding healthy skin, covered with thin epidermis, sharply limited, painless, soft, and freely movable on the deeper structures.

Their essential identity with the preceding form is suggested by the fact that they contained similar intra-cellular parasites. It is possible that the apparent differences are due to external causes. Both of these were in men of the educated class, who kept the growths clean and protected from irritation. It is possible that, if they had been situated on the bare and dirty limbs of fellaheen, exposed to constant friction and bacterial invasion, they might have shown the same proliferative changes, which are so marked in the papillomatous form."

Pathology. This is so well and clearly described by Ferguson that I need make no apology for quoting his account *in extenso.*

Warty form. "So far we have only observed the warty forms in exposed situations, where the skin is normally of considerable thickness and where such growths are liable, in the absence of any protective covering, not only to bacterial invasion but, also, to proliferative changes, consequent upon the maintenance of a chronic inflammatory condition from irritative influences of a diverse nature.

In a thin paraffin section including the elevated margin of the lesion, one sees a number of vertical epithelial columns, which penetrate the dermis sometimes to a depth of 7-8 m.m.

Small, apparently isolated, downgrowths of epithelium, the cells of which have a normal arrangement, also occur in the deeper-lying tissue. Structures resembling cell-nests have been frequently observed, both in the epithelial columns and in the deeper epithelial collection just mentioned. The prickle-cell nature of the epithelial downgrowths is, as a rule, very clearly seen, the intervals between the cells being rather greater than usual by reason of inter-cellular oedema. The stratum granulosum and the keratinous layer are usually considerably increased in thickness. These features of the epithelium are simply those which might be expected to result from any chronic lesion. The cell-nests, for instance, have no greater significance than they possess in other chronic lesions, such as simple warts, scrofuloderma, etc."

PLATE 6



Fig. 1.—Early parasitic granuloma of the leg.



Fig. 2.—A later stage of parasitic granuloma of the feet.



Fig. 3.—Advanced parasitic granuloma of forearm with much old ulceration and scarring. P.A.



Fig. 4.—A similar case to that in Fig. 3. on the back of the hand. P.A.

"The dermis itself is the seat of an exceedingly dense and uniform cellular infiltration which is continuous beneath the entire extent of the lesion. This infiltration is composed of cells of various kinds. The superficial strata of the dermis in the central parts of the lesion frequently contain considerable numbers of polymorphonuclear leucocytes, as well as free nuclei and other cellular detritus, the result of inroads by pyogenic bacteria. More deeply the cellular infiltration is composed almost exclusively of mononuclear elements of various kinds. A certain proportion of these are indistinguishable from lymphocytes. In the midst of this cellular zone, small ill-defined areas are observed, composed of mononuclear cells of much larger size than the preceding class. Such areas, seen under a low power, appear paler than the dense small mononuclear infiltration surrounding them. The parasites are found in the largest numbers in the interior of the cells composing such areas, though by no means exclusively confined to them. The infiltrated areas just described are fairly vascular, considerable numbers of small vessels of capillary character being present.

Hair follicles and sweat glands, which are often encountered, share, to some extent, in the surrounding infiltration, but they have not been observed to suffer any degenerative or destructive change.

Deeply, the infiltrated zone gradually merges into the normal areolar tissue proper to the site."

Flat form. "The skin here, in contrast to the preceding form, is thinned and atrophied, the glands of the skin sharing markedly in the atrophic process. The papillae of the Malpighian layer are represented by very short processes, or are, at the centre of the patch, entirely absent.

A sharply defined zone of cellular infiltration, practically identical in all respects with that described as pertaining to the warty form, is present under the thinned epidermis. Such a growth, examined on section with a pocket lens, closely resembles the subcutaneous nodules sometimes seen in cases of leucocythaemia. The parasites, which occur in the large mononuclear cells described above, were present in such large numbers in both cases of the kind we have examined that the sections appeared to be crowded with them.

The parasite agrees in every respect with the description of Leishmania tropica. They are identical in both warty and flat forms of the lesion.

Our two examples of the flat form were entirely free from micro-organisms. In the warty forms, on the contrary, these were constantly present. These micro-organisms were of many different kinds, and clearly repesented a secondary accidental infection. They were most frequent in the superficial layers and were never found deeply in the centre of the growth.

The examination of a large number of specimens has shown, that, in those cases in which bacteria were most plentiful, parasites occurred in very scanty numbers, or not at all. Our opinion is that the appearance of the bacteria involves the destruction of the parasite. The reason why we have sometimes failed to find the parasite is probably that this process of extinction has reached a point where exceedingly few, if any,

parasites are left. The specimen which contained the largest number of parasites was one which contained no bacteria. Whether the bacteria ever destroy the parasites sufficiently to bring about a natural cessation of the process we have no means of judging, but it seems quite possible.

Summary. "The condition is therefore essentially one in which the sub-dermic tissues are invaded by Leishmania tropica. Almost certainly the parasite, after its entrance has been effected, multiplies in enormous numbers. The large non-granular mononuclear cells are those which are primarily attracted to the site of infection, and they harbour parasites in large numbers in their interior. Whether intra-cellular multiplication of the parasite occurs or not, we have no means of stating with certainty, but it would appear probable. The skin over the site of the infection may or may not show hypertrophic change, in other words the resulting lesion may be either a prominent centrally-ulcerated papilloma or a slightly elevated non-ulcerated patch. In either case the essential nature of the underlying infiltration is the same."

Treatment consists essentially in the complete removal of the growth with a good fringe of skin beyond it in all directions. Usually, exposed deeper tissues are quite clean, and are grafted either immediately or, preferably, about a week later, after which interval one is able to see if the removal has been absolutely complete. This delay is especially indicated in extensive cases, in which the infiltration of the growth has pentrated deeper than is generally the case.

PLATE 7.



Fig. 1.—Parasitic granuloma of feet. Richards and Ferguson.



Fig. 2.—Side view of same case as in Fig. 1

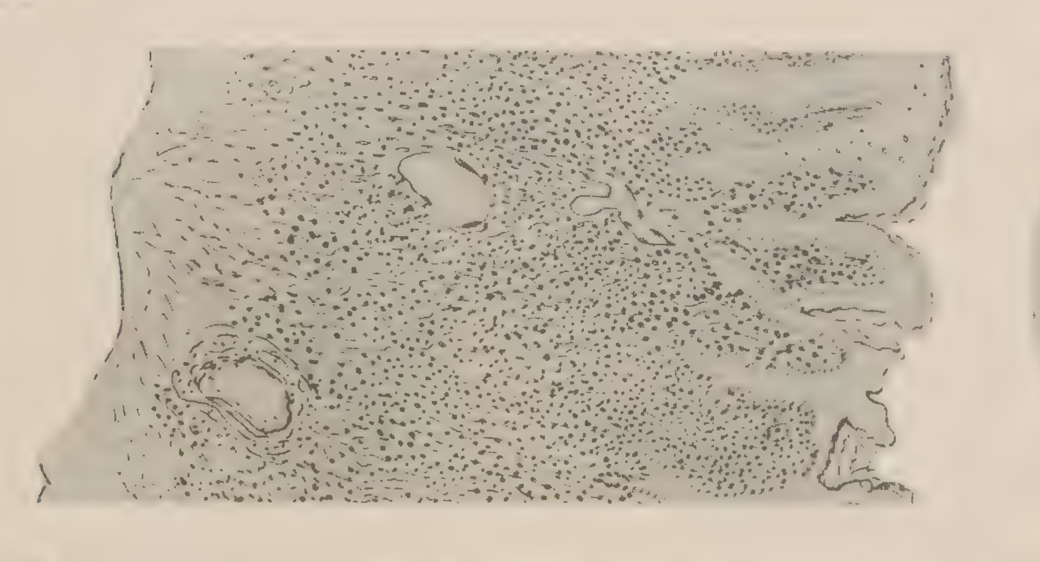


Fig. 3.—Section of raised edge of parasitic granuloma showing downgrowths of epithelium. Richards and Ferguson.

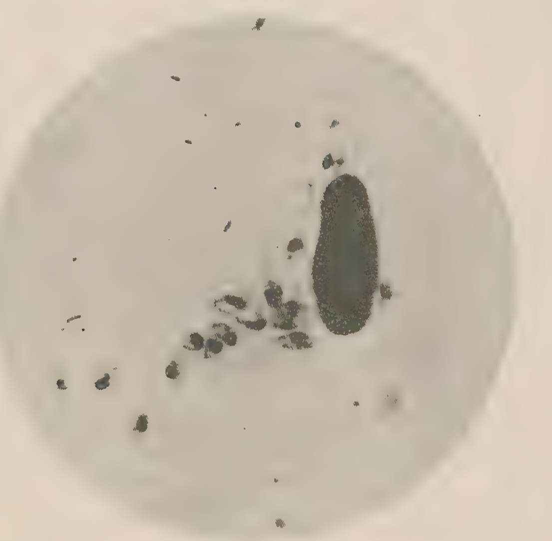


Fig. 4.—Leishmania tropica in parasitic granuloma. Richards and Ferguson.

Fig. 5.—Flat form of parasitic granuloma. Richards and Ferguson.

V. GANGRENE.

Both in hospital and private practice in Egypt, one is struck by the extraordinary frequency of non-traumatic gangrene, and to our shame, be it said, we have often to admit our inability to find a satisfactory cause for this condition. We have sometimes to face the problem why a young man in vigorous health, with apparently healthy arteries and good circulation, should come to the hospital with complete gangrene of both legs, extending nearly to the knees. In older people it is more easily explained on the score of arterial degeneration, though even this occurs at an age much younger than is the case with European patients.

The classical features of gangrene and its pathology, general causation, course and progress, in no way differ from English experience but certain special indigenous varieties require detailed notice.

(1) TRAUMATIC GANGRENE. Among such a careless and fatalistic people it is not surprising that accidents are very common and are often of extreme severity. This heavy casualty list is encouraged by the popular taste for sleeping on the railway line, taking no notice of trams, motors, or, in fact, anybody or anything but themselves, in a public thoroughfare; and an inborn indifference and carelessness in the handling of machinery of all kinds ; all of which also explains why our wards are so congested with bad compound fractures, severely contused and lacerated wounds, and serious injuries generally.

It is, however, a striking tribute to the efficacy of modern surgical methods, more especially to saline solutions and eusol, that *sepsis* is, in the majority of cases, either entirely prevented or kept within manageable limits; and, should gangrene supervene from irremediable injury to the main blood-vessels, the danger of the case is thereby considerably diminished.

Apart from complete division or very severe injury of the main vessels in certain compound fractures or dislocations, — for instance of the knee — traumatic gangrene may follow after any extensive subcutaneous and intra-muscular effusion of blood, (with or without a wound of large vessels and with or without simple fracture) ; and also after very severe wounds of soft parts, especially when large masses of muscles are lacerated and contused.

The onset of gangrene and its subsequent progress follow the usual course. Its danger is profoundly increased in the presence of septic or other infective micro-organisms.

In an *Aseptic, or Mildly Septic, case* the line of future separation is fairly clearly defined and an amputation, sufficiently above this line to ensure healthy flaps, should be done. Unless spreading sepsis intervenes, this operation should be deferred until the line of separation has become quite definite. Further, as in all amputations for injury in general, no set amputation should be slavishly followed, but flaps taken from wherever there is sufficient healthy skin to provide a good covering for the stump,

When *Sepsis* develops and tends to progress in a gangrenous part early amputation is imperative. This must be done well above the apparent limit of the gangrene and if satisfactory flaps can be marked out they had better be left widely open, carefully protected with dressing, and only sutured when the septic inflammation has subsided. A further trimming of flaps may be necessary before suturing, and in all cases where gangrene reappears in the stump, in whole or in part, a similar freshening or even a secondary amputation higher up is required.

Though sepsis is always a possible complication and calls for vigorous treatment as just described, the whole aspect of the case alters when—and often quite unexpectedly—signs of ACUTE SPREADING GANGRENE supervene. Immediate amputation as high up as possible must then be done, but in every case of this nature the prognosis is very grave.

Similarly, GAS GANGRENE may develop with startling suddenness and, though, in some cases, multiple deep incisions, packing with saline or eusol etc. may be effective and bring the part into a better condition and fit for deliberate appropriate treatment later, in almost every case a high amputation must be done at once and all the various measures applicable to this awful condition adopted. In this form of gangrene, and also in acute spreading gangrene, which is of similar type, a circular amputation through all the soft parts and the bone at the same level should be practised; or, preferably, the soft parts may be divided by circular incision, then two lateral incisions made for 3-4 inches upwards, the flaps turned up, and the bone sawn across at the level of the base of the flaps. This provides free drainage from the cut tissues and is often successful in saving the life of the patient. When the local and general condition improves, a secondary amputation must be done higher up the limb. Gas gangrene, of which the war has furnished many examples, but which is not, unfortunately, *confined* to Egypt and so meriting detailed description here, seems to be almost exclusively restricted to bullet wounds. The last case I have seen recently was in an Egyptian civilian who had received severe bullet wounds through the lower third of his thigh.

(This subject should be studied at length in the many papers and communications on the surgery of the war; and the therapeutic value of saline solution and of eusol, the latter both locally and intra-venously, should especially be remembered in this connection.)

(2) GANGRENE FROM ARTERIAL DEGENERATION. Arterial degeneration shares with diabetes the honour of producing by far the majority of cases of non-traumatic gangrene in Egypt.

In many instances the evidences of arterio-sclerosis and enfeebled circulation are only too obvious, especially in patients of middle age or of advanced years; but this type of gangrene not infrequently occurs in much younger individuals—particularly men—who are to all appearances in very good general and arterial health. It is possible that syphilis may be a contributory cause in rare instances; but in cases where the arteries are still elastic and healthy, I must confess myself entirely at a loss to account for this special variety, which is essentially a dry gangrene and *should* be the result of a gradually diminishing arterial blood supply. The patient's

history of a fifteen days' illness with red inflamed and swollen legs after a sudden onset is not to be trusted, and one does not find any evidence, on examination of the heart and arterial system or the urine, to give us a clue to its causation.

Our typical case of GANGRENE FROM ARTERIAL DEGENERATION is an oldish tired-looking man, usually very thin, with all the recognised appearances of faulty nutrition and circulation. His skin is tightly stretched over his bones and he has not a spare ounce of fat on his body. His hands and feet are cold to the touch, and the extremities of the fingers and toes are dull white, or even bluish, in colour, and the circulation is very slowly and feebly re-established after pressure. The terminal phalanx of the great (or other) toe is quite black, dried and shrivelled; and the skin beyond the margin of the gangrene is raised, apparently swollen, and endeavouring to form a line of demarcation at the proximal end of the mummified phalanx. Sensation is impaired all round the dead area, but very often there is a lot of boring pain, especially at night, in the affected part and on the side of the foot and up the inner side of the leg. This pain is so severe that morphia is often necessary.

Gradually, if the part is kept clean and dry and the rest of the foot and leg kept warm, separation takes place, assistance only being required to cut through a piece of bone, disarticulate at a joint, or divide tendons. After this the stump slowly heals over by granulation and the healing may be assisted in favourable cases by grafting.

Other toes may be similarly affected, and there is often a loss of toes; in fact, the whole foot may be variously mutilated by previous attacks. The resulting scars are usually sound but tightly adherent to the ends of the bones.

From these comparatively mild mutilations all degrees of deformity, even with loss of the greater part of the foot, may be found, the extent of the destruction depending on the degree of arterial degeneration and the sepsis that accompanies the gangrene.

The gangrene is essentially dry of itself, but may become moist and spread rather rapidly in the presence of septic infection of its badly nourished and feebly innervated tissues.

It is rarely possible to detect pulsation in any of the arteries of the limb lower than the popliteal behind the knee; indeed, the apex of Scarpa's triangle may be the lowest point it can be found. The arteries from Poupart's ligament downwards are hard inelastic and sometimes quite calcified. Less marked, though similar, changes are observed in the arteries of the forearm and arm. The foot and ankle may be swollen and oedematous to some extent, but there is no serious impediment to the venous return.

The hands are not often affected, but from their appearances they are ready for it, and a lost finger or part of a finger may furnish evidence of an earlier attack.

A systematic examination of the urine must be made in all cases of gangrene, special attention being directed to the estimation of the specific gravity, the general colour and appearance, and the presence of

albumen and sugar. Bright's disease and diabetes are the two most usual causes in Egypt of arterial degeneration, and indirectly, also, of this form of gangrene.

In mutilations of both hands and feet, and with any unhealthy or gangrenous ulceration and destruction, the greatest care must be taken to exclude leprosy as a cause, and a careful examination made for other evidence of this condition.

Treatment. Everything possible must be done to improve the general condition and nutrition of the patient; but I know of no specific drug that has any effect on the arteries or the progress of the disease. Such obvious general measures as warmth by stockings or gloves, with rest, elevation of the part, and proper dressings, need only be mentioned; and, locally, the main object is to keep the gangrenous part clean and dry. This is best done by painting the surrounding skin with iodine and keeping the dead part powdered with cyllin, iodoform or, better, with aristol and starch (1-5). Only when there is any bad sepsis should wet dressings be substituted, the best being eusol fomentations. These also assist the final separation of the slough, which takes place very slowly; and bones, tendons, ligaments and other firm tissues may require dividing to complete the process.

Only if the part becomes septic and a low form of cellulitis begins to spread up the leg must amputation be entertained; and if this should become necessary it must be done in the middle of the thigh, where the pulsation in the arteries is still strong, with the same precautions as will be detailed in diabetic gangrene.

The gangrene which occurs in younger men, though of the same general type, is much more like an embolic gangrene, with a sudden history, the involvement of a very large area, often up to the knee, and sometimes occurring on both sides, and all without obvious arterial degeneration. Amputation is necessary later a short distance above the line of demarcation. In one case of this kind, though the large arteries contained some thrombus, *no* definite embolic blocking could be discovered.

Gangrene from *thrombosis,* with or without preliminary *embolism,* is not uncommon.

Rarely, an extraordinary degree of dry gangrene occurs; and I have seen a case of a man about forty who walked into hospital on the blackened ends of his two tibiae, which were bare almost up to the knee on both sides. Except that "it just happened", he could not give any satisfactory account of the onset and progress of his case.

(3) DIABETIC GANGRENE. Diabetes is very common in Egypt and accounts for a great deal of gangrene of a most dangerous and rapidly spreading type. I have always considered the complication of diabetes with any inflammatory condition, more especially boils, carbuncles, and cellulitis, as one of the most dangerous conditions we meet with here; and it is one which only too often proves rapidly fatal from diabetic coma. If diabetic gangrene occurs in the limbs it may start dry, but it generally passes into a moist and very rapid gangrene which only the most radical measures can control.

PLATE 8.



Fig. 1 —Dry gangrene of the leg after typhoid fever.



Fig. 2.—Gangrene of forearm and hand after fever of undetermined origin.

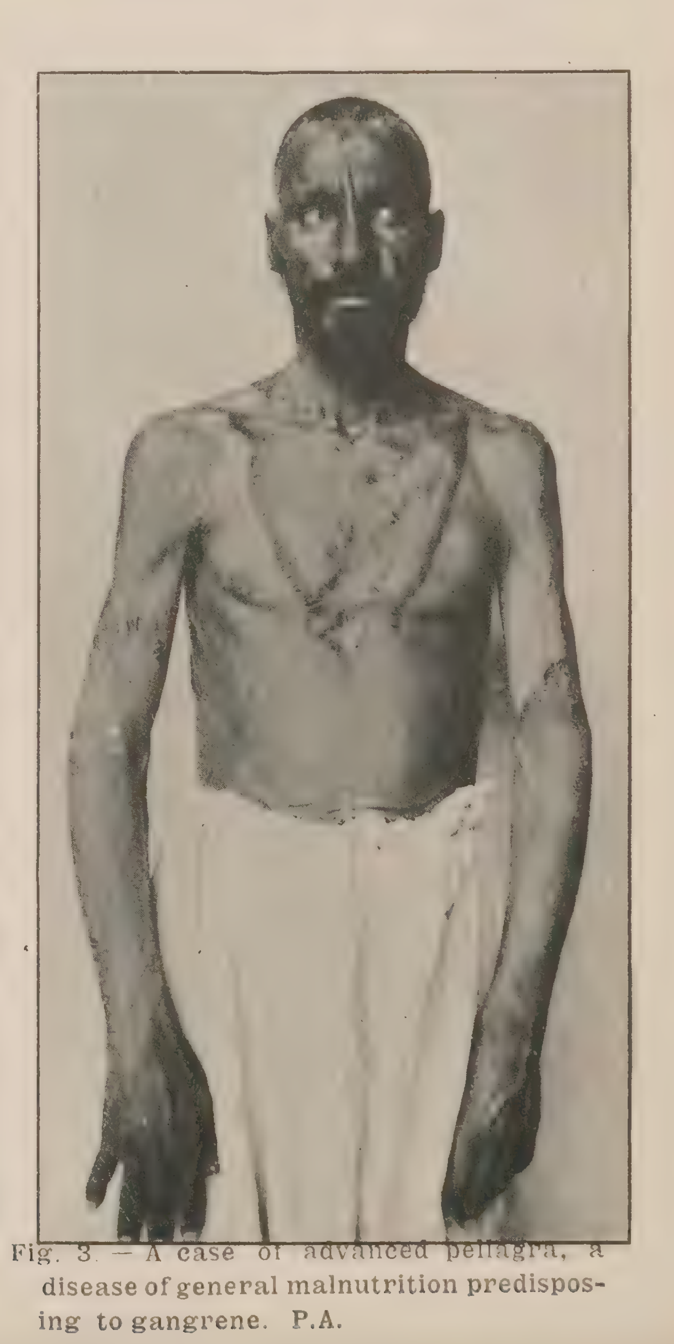


Fig. 3. — A case of advanced pellagra, a disease of general malnutrition predisposing to gangrene. P.A.

I am accustomed to impress the danger of this condition on students, by making them understand that the soft tissues generally are in an enfeebled, 'sugary', state from diabetes, and therefore unable to resist bacterial invasion ; and that there may be arterial degeneration with poor circulation as well, and a neuritis which leads to a deficient innervation of the part, Thus, should any inflammation occur, either as a result of injury or infection from within or without, it is of a very severe type which is very prone to end in gangrene. This may take the form of a slough, as in a boil or carbuncle, or lead to a rapidly spreading gangrenous cellulitis, or a massive gangrene of an extremity.

It will be well to take notice of all the various gangrenes occurring in diabetes in this section ; as, primarily, they are the same, their prognosis is always grave, and their treatment highly unsatisfactory.

(a) *Boils in diabetes.* There appears to be a special tendency for diabetics to pick up sepsis and to develop inflammatory foci in various forms, the mildest degree of which presents itself as boils. These occur in different places, but especially on the neck, sacrum and buttocks. They have the usual characters of boils in general, but are surrounded by a specially angry deep-red areola of inflammation and are often quite painless. They tend to form groups and, unless the diabetic conditions can be soon brought under control by vigorous general treatment, are very dangerous, as extension of the inflammation to the cellular tissues with a rapidly spreading cellulitis may ensue.

Favourable cases do well but, as in all inflammatory conditions associated with diabetes, symptoms of coma may intervene, especially in older patients with long-standing glyco suria, and rapidly determine a fatal issue. Coma may be preceded by acidosis,—in severe cases the breath and the urine have the same odour of acetone—and by a peculiar stupid heavy phase which insensibly merges into profound coma.

Similar, but more severe symptoms arise in diabetics with Nile boils, a particularly virulent infection by staphylococcus pyogenes aureus, and must be even more vigorously treated.

(b) *Diabetic Carbuncle.* This condition lies midway in the increasing scale of severity of inflammatory complications in diabetes and is always to be dreaded. The carbuncles are especially prone to form on the back of the neck, in the middle of the back between the scapulae, over the sacrum, ilium, and buttocks, and very rarely, on the scalp. They are sometimes multiple, are slow in starting, but, once going, suppurate freely and extensively, and spread by cellulitis all round with disquieting rapidity. Certain cases slowly recover under vigorous measures; but, in bad cases, large masses of skin and fascia become gangrenous, the cellulitis soon gets quite beyond bounds, and a general septicaemic infection soon follows. At any time coma may develop and carry off the patient. The quantity of sugar in the urine in carbuncles varies considerably and is exceedingly difficult to control, and the rate of mortality is very high. I well remember a case of a small diabetic carbuncle at the back of the neck, which was incised and healed well after a week's treatment, the proportion of sugar being also reduced to a

minimum. Two days later, another small focus appeared lower down. Pus was evacuated from it by a small incision under local anaesthesia at 1 p.m. At 6 p.m. the patient seemed tired, became unconscious and died an hour later, with all the symptoms of diabetic coma.

(c) *Diabetic Cellulitis and Abscess.* Two distinct types of diabetic cellulitis may be recognised.

The commoner form originates with or around a boil, carbuncle, or other suppurating focus, and spreads widely and rapidly in the cellular tissues as a gangrenous cellulitis. It becomes more and more dangerous as it spreads and soon becomes complicated with a general septic infection, and there is also the ever-present risk of diabetic coma. This acute cellulitis also arises in diabetic gangrene of the extremities and follows the same septic and dangerous course.

In addition to these secondary forms of cellulitis, diabetic gangrene may *originate* in a cellulitis and by its rapid and extensive spread be even more difficult to control than the preceding varieties.

In other parts of the body, and especially about the buttocks and the thighs, the first evidence we may find of a diabetic cellulitis is a hard indurated inflammatory mass of even some months' duration. This eventually bursts, after repeated poulticing, discharges a considerable quantity of dirty foul-smelling pus and then persists as an irregular opening with much induration around. If this is opened up a lot of deep sloughing of fasciae and muscles is exposed. Even now these sloughs are black and gangrenous, or soon become so, and large areas of inflamed and oedematous skin gradually separate off, until a very ragged gangrenous septic wound results, which sometimes extends along the greater part of the thigh. Septic infection is inevitable and most cases prove rapidly fatal.

The more hopeful cases of this nature, infrequent though they be, are those in which quite deep collections of pus slowly form in the substance of a muscle or in inter-muscular planes, in and around the latissimus dorsi for instance, and are bounded by a hard barrier of inflamed tissue. Here, with vigorous general treatment and hot applications locally, the abscess my be kept localised and opened by a single free incision when it has become ripe and freely fluctuant. Under local anaesthesia the pus is evacuated, a drainage tube inserted, and, with frequent washings with oxygen water or eusol, most of these cases do quite well and heal without any untoward happening. Indeed, so unexpectedly satisfactory are some of these cases, and so completely does the sugar disappear from the urine after treatment, that it is difficult at times to satisfy ourselves that we are really dealing with true diabetes and not with a case of temporary glycosuria.

Non-diabetic carbuncle is not infrequent in Egypt, and with it there may often be temporary glycosuria which soon clears under appropriate treatment.

Treatment. Whatever the surgical condition discovered in a diabetic, the most rigorous general treatment must be adopted. The most rigid anti-diabetic diet possible, having regard to the condition of the patient;

large quantities of water and Vichy (Celestins) water, (which is really a dilute solution of bicarbonate of soda); bicarbonate of soda in 15-20 grains (1.0) doses, four times a day, in Vichy water ; pills consisting of codeinae 0.10 : extract of nux vomica 0.015 : excipiens q. s.: twice a day ; takadiastase, 0.30, three times a day ; with rest and quiet; are the main indications. Further, in all septic cases in a diabetic, however slight, a mixed staphylococcus and streptococcus vaccine (starting with 100 million and 5 million respectively) must be given and repeated at five day intervals ; and, in severer cases, electrargol, lantol, and all the other general and local measures detailed in the section on septic wounds, must be pressed into the service.

If acidosis threatens give bicarbonate of soda by mouth, by rectal injections, by intra-venous injection—a 3-5 % solution—and push all the general measures for diabetes to their utmost limit.

Locally, boils should be dressed with hot alkaline fomentations, of bicarbonate of soda and citrate of soda, in proportions of 0.30 and 0.065 respectively to each 30.0 of water, frequently changed; and, as alternatives, oxygen water, hypertonic saline solution, or eusol. No attempt must be made to remove the core before it is quite loose, and this is especially the case with Nile boils.

Incise under aseptic precautions any area of cellulitis around and evacuate abscesses as they occur and dress all with eusol. Bipp may also be useful as a dressing.

For carbuncle, large constantly changed fomentations of the same solutions, or packings with gauze soaked in eusol, must be used and the general treatment as for boils. Free and early incisions may be of great value and are at once called for if cellulitis or any pocketing is observed.

The greatest care must be taken with the anaesthetic in any operation in diabetics. Local anaesthesia, with 1 % cocaine, or quinine and urea hydrochloride, or even freezing with ethyl chloride, is best whenever possible. If a general anaesthetic is necessary, avoid chloroform and give ether alone, or after a very small preliminary dose of chloroform. There is a very grave risk of acidosis, and later coma, after chloroform and indeed after any general anaesthetic. If it is possible, it is best to operate under spinal anaesthesia by stovaine.

With these reservations, all degrees of diabetic boils, furunculosis, carbuncles, cellulitis and abscess must be treated as if no sugar were present. We must not be frightened by the knowledge of glycosuria and so take a hopeless view of the case and neglect every possible means of treatment. Much can be done and we must do it, always remembering the supreme importance of general treatment.

(d) *Diabetic gangrene of the limbs.* This is only too common in Egypt and starts in different ways.

There may be a definite *history of injury* and the formation of an abrasion or contusion, or even an ulcer, especially on the toes or feet : but more often the first stage is a cellulitis, at first quite insignificant but assuming a much graver aspect when the urine is found to contain sugar. Once started this runs the usual course of diabetic cellulitis elsewhere

and is very soon up the leg or arm and spreading in all directions. Very little blackening of the skin may be present at this stage, but an incision into the swollen part will confirm the fear of gangrenous cellulitis, and the very vigorous general and local treatment above detailed must be at once adopted. As the inflammation proceeds up the limb, the foot or hand soon presents all the signs of septic moist gangrene behind it.

Or it may begin as a subcutaneous *whitlow,* especially of the fingers, the inflammation from which soon extends to the tendon sheaths and also becomes a cellulitis. Rapid extension takes place by way of the tendon sheaths and cellular planes and thence to muscles and tendons of the forearm and so on upwards. The fingers and hand are already gangrenous, in whole or in part. aud everything is intensely septic. This terrible condition may show itself in two or three fingers of one hand and often affects both hands ; and I have seen one case, in an engineer in the prime of life, in whom both arms went gangrenous up to the elbows and the left leg nearly to the knee, before he was mercifully carried off by the virulent septic infection and coma.

Other cases of diabetic gangrene of the limbs conform to more regular standards from arterial degeneration and present themselves as an extensive dry gangrene of the toes and feet. This tends, sooner or later, to become moist and septic and with the coming of cellulitis may run the same dangerous course as the forms just described.

Treatment of diabetic gangrene of the limbs. First and foremost comes the general treatment; and, locally, each case must be treated entirely on its merits and not timidly and half-heartedly because it happens to be diabetic.

The general principles of treatment may be expressed as follows:- In the primary cellulitic form, treat the gangrenous cellulitis first by free incision and by all the other means at our disposal for the treatment of septic cellulitis ; but immediately the ascending inflammation, superficial or deep, begins to escape beyond bounds, amputate well above the limit of the inflammation. This generally means at or above the knee joint or elbow joint.

When the trouble begins as a whitlow, treat this primary condition very thoroughly first, then deal with the subsequent gangrene and the cellulitis spreading beyond it as just described. Too often, however, in these cases, very little can be done.

In the more massive gangrene of the foot or hand, in favourable cases, when it is still dry, keep the parts as clean and dry as possible, and when the local and general condition of the patient has improved, amputate above the knee. If the gangrene starts to spread, or becomes moist with a swollen foot, amputate at once above the knee, and as rapidly, gently, and aseptically as possible, so as to ensure primary union of the flaps. Never forget the dangers of the anaesthetic.

(4) GANGRENE FROM MALNUTRITION. Certain cases of dry mummified gangrene occur from time to time in old enfeebled patients suffering from such debilitating conditions as pellagra, severe anchylostomiasis etc. They usually run the same course as those of senile or arterial gangrene.

PLATE 9.



Fig. 1.—Gangrene of the scrotum with separation of slough and exposure of testicles.

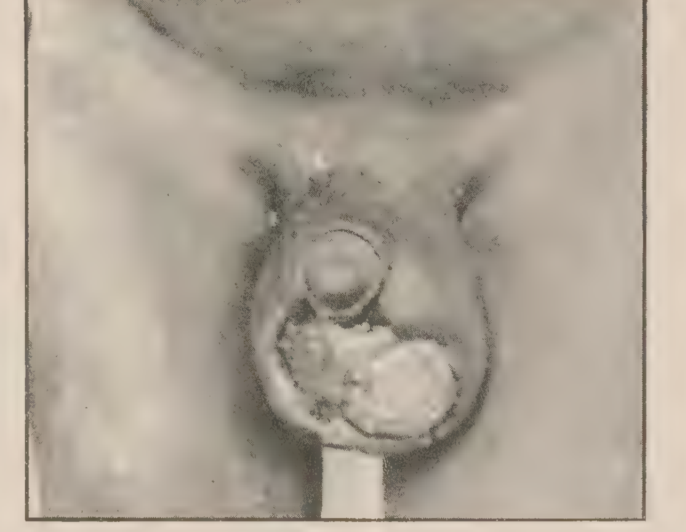


Fig. 2.—Gangrene of the scrotum after separation of the slough.



Fig. 3.—Gangrene of the scrotum at the base of an elephantiatic scrotum.

Fig. 4.—Healing of a grafted area after gangrene of the scrotum. The swelling is due to an irreducible hernia; but the extent of the raw surface left after the separation of the slough is well seen.



Fig. 5.—Gangrene of the whole thickness of the skin of the breast including the nipple. The process is of the same aetiology as the preceding cases.

It is possible that, just as ergot is credited with producing gangrene in diseased rye, old and diseased maize, which forms a staple part of the dietary of the poorer people in many districts, may undergo similar fungus changes and exert a similar vaso-constrictor effect on the already enfeebled vessels.

Raynaud's disease, however, is very rare indeed, and I can only remember to have seen one case.

Frost bite is conspicuous by its absence.

(5) GANGRENE OF THE SCROTUM. In the colder months of the year several cases of gangrene of the scrotum are admitted. These are not always in old men, and we have never seen the earlier stages of the condition. When they reach us they have a black area of gangrene, sharply demarcated from the remainder of the scrotum and generally involving the whole circumference of the sack in its lower half, and sometimes even extending right up to its neck. The separation may be still progressing or the dead part may have already dropped off. The whole thickness of the scrotum is affected and after separation of the slough the testicles lie quite bare and exposed, suspended by the cords. As a rule, the separation is very effective; no sloughing area is left on the remains of the scrotum and very little sepsis. This only occurs during the actual separation.

We can only suppose that the original condition is in the nature of a superficial and deep cellulitis, of such intensity as to lead to the blocking of the blood supply of the scrotum in the inflamed area, and thus gangrene. We have tried to think it may be due to cold, from the scrotum resting on the cold ground when in the squatting position, which is that commonly assumed by the poorer people, but this is only a surmise and put forward in default of a better solution.

A somewhat similar idiopathic gangrene of the *eyelids* and also of the *breast* is also met with in Egypt.

Dr. Anis Bey Onsy, Assistant Professor of Pathology, has recently made a special study of this condition, and has allowed me to include the preliminary notes of his investigations as follows:—

"This condition of gangrene, which affects the eyelids and breasts equally with the scrotum, invariably commences as an acute cellulitis, with much oedema, and enlargement of the nearest lymphatic glands. There is pain, much general malaise, and high fever. This acute stage lasts for 5-6 days, when marked induration, roughness of the skin, and evidences of commencing gangrene supervene, with the onset of which the pain, fever, and other general symptoms subside. A slough forms, which is sharply defined from the surrounding tissues, and when separation occurs, a clean raw surface is left.

"In all the above-mentioned cases, an organism was separated from the midst of a great number of other pyogenic and saprophytic organisms. This is a small bacillus about 2.5 - 3.5 microns long, though sometimes there are filamentous forms of 10-12 microns or even more. The organism is very resistant and is found living in cultures 12-14 weeks old. It grows very luxuriantly on ordinary media. On agar it produces a rich growth,

slightly opalescent, or fluorescent or opaque, with minute small colonies at the margin. It does not liquefy gelatine. It is a facultative aerobe, Gramm negative, but staining easily with all basic aniline dyes. On culture it begins to show involution forms about the third day. Its further characters are still under investigation.

"Emulsions of 24 hour cultures of the bacillus have been injected into the subcutaneous tissues of the lower eyelids of horses and the above mentioned signs, terminating in gangrene on the fifth day, have been typically reproduced. The same emulsion was injected into the subcutaneous tissues of guinea-pigs' abdomens and the results were precisely the same, with gangrene on the fifth day. Cultures were rubbed on the noses and eyelids of rabbits and guinea-pigs and produced similar effects, all showing commencing gangrene on the fifth day.

"In practically all the cases examined the patients were fellaheen who are directly engaged with the removal of manure, or work with dust and dirt, as in the threshing of corn and maize."

On the strength of these results, I have ventured to call this organism the Bacillus Onsy, and must congratulate the investigator on a very good piece of work.

As for *treatment*, if the part is septic and the gangrenous mass wants helping off, repeated eusol fomentations or baths are most useful till separation is complete and the wound clean. In small denudations grafting may then suffice to produce healing, but nearly always the edges at the line of separation must be freshened and a new scrotum fashioned from the perinaeum and the thighs, in much the same way as is done after the removal of an extensive elephantiasis of the scrotum.

VI. BURNS.

For reasons already detailed, but especially from carelessness, blindness, and absent mindedness, many and extensive cases of burns come under our notice. They have, however, no essentially Egyptian characteristics, unless it be their severity, and we need only describe our routine management of an ordinary hospital case.

All cases on admission are suffering from shock to some extent, and many are in a state of profound collapse. No local treatment must be attempted, therefore, *until the general condition has been attended to.* Some cases, indeed, die of shock before any dressing of the actual burn can be thought of, while others may have to remain first for several hours under general stimulation. My expression to students is to "first treat the patient and then his burns"! After all, the fire is out and no further local damage, except from sepsis, can be done. Our burnt patient is put to bed in his clothes, in fact, just as he comes in, covered with blankets and packed with hot water bottles all round him; and given brandy, strychnine, saline by rectum by skin or by vein, and all the many measures for combating shock from this or any other cause. If he is in great pain or very restless, an hypodermic injection of 0.01 (1/6 gr.) of morphia is often of the greatest value and may be repeated. The finest shock reviver we have is the *electric light bath.* I originally started this method for tiny children suffering from shock, but we have now adapted it to all ages. It simply consists of a large bed-cradle to which is attached 6 to 8 electric bulbs on a single wire, which may be connected with the main electric supply by a key and plug. The patient is enveloped in a blanket, the cradle placed over him (with only his head out), and covered over like a tent with more blankets which are tucked in at either end of the cradle. The plug is inserted, the lights are lit, and very soon the patient is lying in a very hot atmosphere as in a hot air bath. Hot drinks and other appropriate remedies are given as well and the improvement in his general condition is often remarkably rapid. I have seen many lives certainly saved by these baths.

Once the patient is fit to be dressed his dressings must first be made ready, so as to allow as little exposure of the burn to the air as possible ; the clothes are cut off with all care and the wounds quickly attended to and dressed. In practically every burn the first dressing is lint soaked in a 1 % watery solution of picric acid. This is covered with a thick layer of sterilized dressing and gently, but sufficiently firmly to prevent slipping, bandaged on or fixed in place with a triangular bandage.

The essentials of our *local treatment* of burns in clean cases are picric acid, followed by an ointment of equal parts of boracic ointment and vaseline, or a special burn dressing, until the burn becomes a wound healing by granulation, when it must be very carefully treated as such by all the various methods already described in the section on ulceration.

I have just read in the Lancet of Sept. 2nd 1916 an excellent account of the local treatment of burns on a Naval hospital ship by Staff Surgeon R.J. Willan, which is so exactly our own routine that it might have been written in the wards of Kasr el-Ainy. I cannot improve on this description and therefore reprint it almost as it is, with such comments as our local experience dictates.

Staff Surgeon Willan's cases numbered 28, which came under treatment either immediately after, or forty eight hours after, the burns were inflicted. Fifteen were aseptic and all recovered; but the remaining thirteen were septic to a greater or lesser degree and five of them died, though one case had other severe injuries. Four of the cases developed erysipelas.

The following is the plan of treatment :---

1. The blisters are punctured and the contents drained off under strict antiseptic precautions, the surface being first sponged with carbolic solution 1 in 20 (or cyllin or lysol, 1 in 200).

2. If it is a recent burn the picric acid is applied as a first dressing.

3. The dressings are smelt at morning and evening rounds. Early sepsis in burns has an unmistakable odour and can at once be detected.

4. If there is no smell the first dressing is left on for two days, when it is removed to puncture any further blisters which may have formed. If this is not done the coagulated serum may become organized by vessels from the deeper layers of the skin and may form keloid. An ointment of equal parts of boric ointment and vaseline, spread on lint, is now applied and changed daily. (This ointment is not irritating, as plain boric ointment may be, and must be plentifully spread on the lint. We also use with very good effect a special burn dressing, consisting of oxide of zinc 20.0 ; eucalyptus oil 0.20; and arachis (pea-nut) oil 50.0; and I have also prescribed dermatol and oxide of zinc āā 10.0; eucalyptus oil 1.0; lanoline 100.0; with much relief. On the face and neck I prefer plain sterilized vaseline or a good cold cream).

5. If the case has the septic smell, the dressing is at once removed and boracic fomentations applied every four hours. (Eusol fomentations may be preferable ; and, unless the sepsis is extreme, an attempt may first be made to continue the picric acid dressing by changing it twice a day. In extreme cases the burnt area should be frequently irrigated with eusol or a ½ % solution of picric acid, and, if possible, put into a local bath of these solutions for an hour at a time; and dressed at other times with fomentations. For baths, *normal* saline solution or a 5 % solution may also be used; or cyllin, in the proportion of 1 in 1000). All sloughs should be removed as soon as possible and when the burn has cleared up and a clean surface is left, the ointments above-mentioned must be applied.

6. If the burn is aseptic the loose skin of the blisters is not removed, but is left to act as a protection to the exposed deeper and painful layer of skin ; but if the burn is septic all loose skin is cut away owing to the risk of septic absorption beneath it.

7. Face masks are not used except when fomentation is required. With face burns the nose cheeks and lips are frequently smeared with the diluted boric ointment (or sterilized vaseline) which is gently massaged in with the convex surface of a teaspoon.

Throughout, the greatest possible care is taken to prevent any infection of the burn wound, and these precautions are particularly important when the wound is already septic, as every effort must be made to eliminate sepsis as quickly as possible. In short, a burn must be dressed with all the elaborate ritual observed in the routine dressing of a clean, or a septic, wound, bearing in mind always that the most dangerous and fatal complication in burns, after the first shock has been recovered from, is sepsis.

In addition to the local measures already detailed for septic burns, vaccines, anti-streptococcic serum and intra-venous eusol or saline must be remembered, and the general treatment for septic infection from any cause.

PLATE 10.

Fig 1.—Epithelioma developing in the scar of a burn. Marked webbing and flexion of the knee from contraction of other scars.

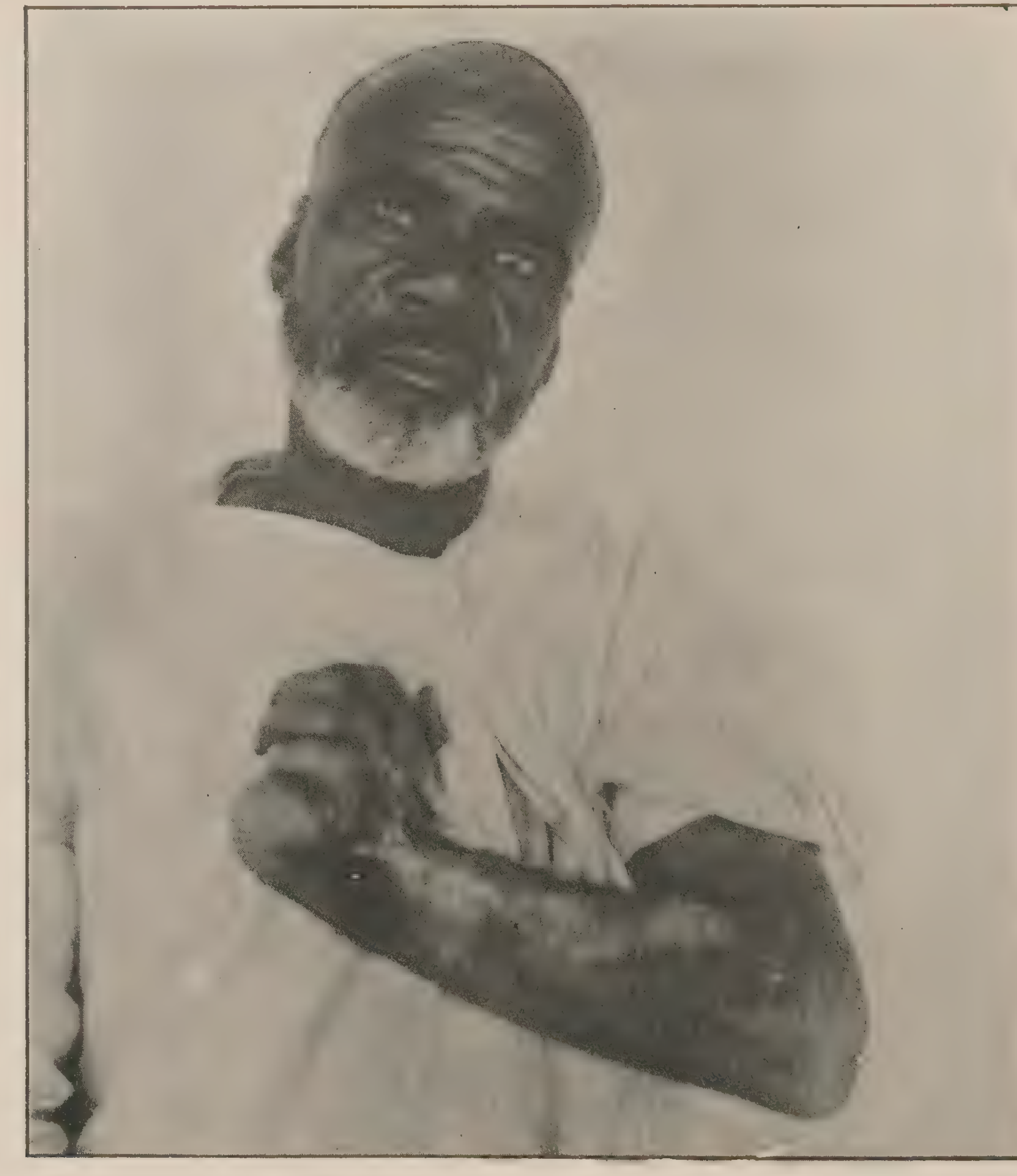


Fig. 2.—A comparatively common degree of contraction of scar after a burn. P. A.

In actual practice the only serious general *complications* of burns are shock and sepsis ; and, later, a chronic septic condition may develop and death from a combination of septic absorption and exhaustion. The other 'text book' internal complications only occur in the presence of sepsis and are entirely secondary to it.

Locally, the scars of burns undergo all the well-recognized changes; and contractures involving the face neck and various joints are very often seen, while keloid runs the same uncertain course as elsewhere. One has no guarantee when a keloid will form in a case of burns and sometimes it comes on quite late, after the whole area has firmly and smoothly healed. Much may be done to prevent keloid and many other of these local complications by attending very patiently to the emptying of blisters, the dressing of the granulating wound, and the keeping down of redundant granulations ; and later, by stimulating epithelial growth from the sides of the wounds and by judicious grafting, as described in a preceding section. Similarly, the use of splints, extension, gentle movements and exercises may all be required at one time or other ; but too often, in spite of all our efforts, extensive scarring and deformities result and call for complicated and repeated plastic operations. Especially must we try and guard against the formation of KELOID, which is a particularly disfiguring condition and very intolerant of treatment. Very good results sometimes follow the careful application of X-rays or radium, or ionization with iodide of potassium, and these treatments should always be tried. In case of failure there only remains the repeated injection of fibro-lysin into the scar tissue with massage over the infiltrated area; or, finally, the wide excision of the whole mass, with either plastic closing of the gap or grafting.

EPITHELIOMA not infrequently develops in the cicatrices of burns and requires early and radical excision.

VII. SPECIFIC INFECTIOUS DISEASES.

In this section we propose to deal only with certain local features of the specific infectious diseases. We presuppose the necessary knowledge of blood examination in general and of the technique necessary for determining the particular micro-organisms responsible for the various diseases, and the application of certain special tests in blood or other fluids.

ERYSIPELAS only requires the barest mention. It is quite common, as must needs be with so much primary and untreated sepsis, and, though difficult to detect on a dark skin, it presents no other peculiar features.

Early painting with iodine is sometimes beneficial, and other cases do well with eusol or picric acid (in ¼ % solution with rectified spirit and water).

For facial erysipelas an ointment of ichthyol and lanoline in equal parts often has a very good effect. For the rest erysipelas calls for streptococcic vaccine and anti-streptococcus serum and, both locally and generally, is a septic and an infectious condition and must be treated as such, with all the special drugs commonly employed for erysipelas in addition.

TETANUS is always with us, especially in the damp late summer months and at the end of the cold season. It may come after all kinds of wounds and has an extremely variable incubation period. The earliest I have personal knowledge of was 36 hours, but it may not come on for 21 days, or even more, after the infliction of the wound. All serious wounds are given anti-tetanic serum on their admission to hospital, and since this has been the routine practice, the number of cases of tetanus developing in hospital has become progressively less.

Almost invariably the first symptom complained of is a pain and stiffness in the back of the neck (Ar. Ra-abtee رقبة), whence it radiates to the shoulders and to the jaws, mouth, and face, and then further afield. Once thoroughly developed, the case is not different from tetanus of other countries, except that it tends to progress very rapidly. The prognosis as regards mortality entirely depends upon the rapidity of development of symptoms in the first day or two. To put it in another way, if a patient stricken with tetanus lives for ten days after the appearance of his first symptom, he will probably get better, whatever is done to him in the way of treatment. The cases of so-called cures after enormous doses of anti-tetanic serum would nearly all have got well without all this anti-toxin and have, indeed, done so in spite of it. Certain fulminating cases die within 36 hours ; but chronic tetanus, that is tetanus of fifteen days' duration, is hardly ever fatal from the disease itself.

Treatment. With such a tricky disease as tetanus, which may even get well in spite of us, and of whose probable rate of progress we have no means of judging, one is rather apt to give too much credit to certain special drugs and measures, which they may not at all—or only partially—deserve. It is best, therefore, to realize this uncertainty of the

disease at the outset and try, first of all, to prevent its coming at all; and, on its appearance, not to rely too much on one particular method of treatment, but to remember that it is a desperate condition and calls for desperate measures, which we must be ready to provide as the case demands.

More important than anything else is *prophylaxis.* Every case of injury that has the least chance of developing tetanus, in such a hot-bed of the disease as Egypt, must be given 10 c.c.—1500 units—of anti-tetanic serum ; and this may be repeated in eight days if one has any premonition of danger.

The *wound* at this stage is simply a septic or potentially septic focus, and should be given all the care and attention such an injury demands, to try and keep it or make it clean. Such penetrating antiseptics as eusol, picric acid and iodine are of great service ; and when the wound begins to look unhealthy, the freest possible drainage must be provided to prevent any accumulation of discharge. Should tetanus actually develop, more vigorous measures must be taken, as will be described later.

At the first sign of impending tetanus, we must be ready to act immediately and vigorously on a well-defined plan, and we cannot do better than adopt the principles of treatment, as laid down by the Special Committee appointed by the War Office for the study of tetanus, and lately published as the third edition of the " Memorandum on Tetanus ", which is here quoted in its essential details in full.

This memorandum on the prophylaxis and treatment of tetanus has been drawn up with the authority of the War Office by the War Office Committee for the Study of Tetanus, and is to a great extent based on experimental and clinical evidence which has become available since the beginning of the present war.

1. THE PROPHYLACTIC OR PREVENTIVE TREATMENT OF TETANUS.

"The prophylactic value of injections of anti-tetanic serum is beyond all doubt, but there is strong experimental evidence that in about ten days the immunity conferred by an injection is, to a great extent, lost.

It is impossible from the appearance of any wound, to determine whether it is infected with tetanus bacilli or not; and whereas many cases of tetanus have occurred not only in men with healed wounds, but also in those whose wounds were from the beginning practically clean, it has been decided that all wounded men shall receive at least four injections of anti-tetanic serum ; that is to say, a primary injection, given at the time of the wound, and three others.

It is therefore essential that a second, third, and fourth subcutaneous injection should be given to all wounded men; and in order to anticipate the total disappearance of anti-toxin from the body, the second injection should follow the first at an interval of seven days, or as soon after this as possible. The third and fourth injections must also follow at the same interval of time.

As many cases of tetanus have occurred in men suffering from trench feet, sometimes without obvious breach of surface, these cases must be treated as wounded men."

2. DOSAGE IN PROPHYLACTIC OR PREVENTIVE TREATMENT OF TETANUS.

" It may be definitely stated that the danger of anaphylactic shock is negligible when prophylactic doses of 500 U. S. A. units contained in 3 c.cm. or less of horse serum, are given subcutaneously. This holds good however long the interval between the injections may be. There may be sometimes a serum rash.

The primary injection, given at the front, consists of 500 U. S. A. units, and the second, third and fourth injections should be of the same amount.

The primary injection is given, as a rule, at the Dressing Station of a Field Ambulance, as soon as the wounded soldier is removed from the firing line. The second and following injections will most frequently be given at Home Hospitals, and sometimes injections will have to be given at Auxiliary Hospitals. The ordinary phial usually contains 1,500 units of tetanus anti-toxin. One third of a phial should, therefore, be injected into each wounded man. Phials containing a single dose of 500 units are also now available. There is no necessity to sterilize the syringe after each injection, as the serum is aseptic and, moreover, contains an antiseptic; it will be sufficient if a freshly sterilized needle be used for each case.

It is hardly necessary to add that care should be taken to ensure that the skin and needle are both sterilized, as neglect of this precaution is apt to lead to abscess formation."

3. PRECAUTIONS TO BE TAKEN BEFORE OPERATING ON WOUNDS.

"When operations are performed at the site of wounds, even if they are healed, a prophylactic injection of serum should invariably be given if the operation be performed at a greater interval than seven days from the last injection.

This precaution is very necessary, as numerous cases have occurred in which the performance of a simple operation has been followed by an attack of tetanus, although in many cases the primary wound had been healed several weeks before the operation.

This precautionary injection may consist of a single subcutaneous injection of the ordinary prophylactic dose of 500 units, or a larger dose may be injected if it be thought advisable.

It is better to give it two days before the operation, as it takes some 48 hours for the anti-toxin to be fully absorbed after subcutaneous injection. Injected intra-muscularly the absorption is quicker—probably in about 12 hours, so that this method could be used if time were pressing."

4. ANTISEPTICS WHICH MAY BE OF USE IN THE PREVENTIVE TREATMENT OF TETANUS.

"The group of oxidizing antiseptics, such as hydrogen peroxide, potassium permanganate, chlorine water, Dakin's solution, and solution of iodine, are particularly unfavourable to the anaerobic growth of the tetanus bacillus. They have also the power of rendering toxin non-toxic."

5. DIAGNOSIS.

"The classical symptoms of tetanus, as described in the majority of text books, refer to a phase of the disease in which treatment will have lost much of its power and value. With many medical men tetanus is not tetanus until the symptoms of *risus sardonicus* and lockjaw are present.

In those who have been partially protected by a prophylactic injection of anti-toxin, trismus and general symptoms may not occur at all, or not until late in the disease, possibly not until months have elapsed. This is known as delayed tetanus. In such cases the manifestations of tetanus may be confined to local spastic rigidity of the wounded limb, which may persist for weeks or months and then disappear; or may develop into generalised tetanus. This so-called localised tetanus is a distinct and not infrequent type of the disease and should be carefully watched for.

The early diagnosis of tetanus is of the greatest importance. All clinical and experimental evidence tends to show that the chances of successful treatment diminish rapidly as the length of time increases after the first symptoms have been observed.

"Tetanus toxin reaches the motor nerve cells of the central nervous system by travelling up the nerves; it is not directly conveyed to the nerve cells by the blood. In a large number of cases the toxin appears to reach the spinal cord primarily by the nerves which are in connection with the seat of the injury, and, therefore, the motor nerve cells governing the muscles around the wound will be the earliest affected, such affection showing itself in the form of spasticity and increased reflex excitability of these muscles. The patient may complain of jerking or jumping, or stiffness in the affected limb, occurring especially at night. In some cases these symptoms may precede the other symptoms of tetanus by many hours or days. It is therefore desirable that the muscles in the vicinity of the wound should be examined whenever dressings are removed, and the occurrence of rigidity or twitchings, or of local increased reflex response to gentle tapping or pressure, should be immediately reported to the surgeon in charge.

All nursing sisters engaged in dressing wounds, should be warned to give the alarm if the muscles round the wound should be harder or more rigid than the muscles of the uninjured limb or side.

In other cases tetanus toxin is absorbed from the wound into the blood stream and reaches the central nervous system by way of nerves other than those in direct anatomical continuity with the wound, and, hence, early symptoms may sometimes be observed in muscles supplied by any motor segment of the cord or brain.

The muscles supplied by the fifth nerve are those most commonly affected, as is shown by the occurrence of trismus as an early symptom. In a wounded man this symptom should be taken as a decisive indication of tetanus in the absence of any other obvious source of reflex spasm. Other cranial nerve symptoms may be facial spasm or paralysis, or paralysis or spasm of the eye muscles with consequent strabismus.

Spasm of the pharyngeal muscles may also occur, which is often complained of by the patient as sore throat, and occasionally cause reflex yawning. The tongue muscles may be affected, causing deviation of the tongue when protruded. Tetanic spasm of the neck muscles may be complained of as stiff neck. Spasm of the thoracic and abdominal muscles is an occasional early symptom, often giving rise to complaints of stitch in the side or to difficulty in micturition.

Often before the onset of any definite symptom of tetanus there is a general increase of muscular tone, and the deep reflexes are exaggerated; knee and ankle clonus may be produced in the absence of any signs pointing to the involvement of the pyramidal tract, such as an extensor plantar response or loss of the abdominal reflexes.

The general increase of tone is manifested in the facial muscles by the drawn expression of the patient, and the increased reflex excitability often leads to psychical irritability and insomnia.

The occurrence of a generalised tetanic toxaemia may be marked by profuse local or generalised sweating.

Once the diagnosis of tetanus has been definitely established the patient should be examined as little as possible."

6. THERAPEUTIC OR CURATIVE TREATMENT OF TETANUS.

"It cannot be too strongly emphasized that time is the all-important element in the treatment of tetanus. As short a time as possible should be allowed to elapse between the diagnosis and the commencement of active treatment. A delay of an hour may make all the difference between success and failure.

"It is on this account that the early symptoms are of the greatest importance. In almost every case of tetanus, in those who have received a prophylactic dose of anti-toxin there are found local manifestations of the disease, very often hardness and rigidity of the muscles round the wound; and these signs can be seen or felt for days or even weeks before the occurrence of trismus. In a case on record, these local symptoms had been present for three weeks before the trismus showed itself and before tetanus was suspected. One Medical Officer is reported to have said that

symptoms of tetanus were present in a case but were not sufficiently severe to justify the use of anti-toxin. According to present ideas it should no longer be permissible to wait for the occurrence of lock-jaw before deciding that the case is tetanus ; 5,000 units of anti-toxic serum are of more avail at the very beginning when the disease is still localized, than 50,000 when the symptoms have become general. The moment, then, that any local manifestation of tetanus is observed, it is recommended to proceed at once to vigorous specific treatment. It is even more urgent to act on the earliest manifestation of trismus without waiting for the appearance of other signs of tetanus."

"The *treatment of tetanus* may be divided into specific and symptomatic.

1. *Specific.* Specific treatment consists in the giving of tetanus anti-toxin, which has the power of neutralising the tetanus toxin with which it comes in contact. The problem in treatment is to bring about this contact in the fullest and speediest manner. There are four methods which are commonly employed for the administration of antitoxin :---

(a) *Subcutaneous.* In this method the serum is injected beneath the skin, from whence it is slowly absorbed into the circulation ; it has been determined that some 48 hours elapse before the maximum concentration in the blood is reached. This slowness of absorption is an advantage when it is desired that the action of the serum should be prolonged, as in prophylactic administration. But it is a grave disadvantage when quickness of action is all-important, as in acute tetanus ; in such a case little can be expected from this method at the beginning of treatment, although it is useful later in order to keep up the anti-toxic action.

(b) *Intramuscular.* Here the serum is injected into the muscles, from which it is absorbed into the circulation more rapidly than from the subcutaneous tissues. It is, therefore, as regards speed, better than the subcutaneous method : nevertheless, it must be remembered that full absorption, even here, takes 12 or more hours.

(c) *Intravenous.* Here the serum is injected directly into the blood stream and immediately diffused throughout the body in such a way as to neutralise all circulating toxin. This is the most rapid route by which the neutralisation of circulating toxin can be accomplished. The objection to this method is that large doses of serum introduced into the circulation, in persons who have previously had an injection, is apt to bring about anaphylactic shock, which may prove fatal. Intravenous injection is therefore not recommended, except in cases where the intrathecal method is, for any reason, impossible.

(d) *Intrathecal.* Here the serum is introduced by lumbar puncture into the sub-arachnoid space of the spinal canal. It soon begins to escape into the blood stream, so that the neutralisation of circulating toxin is quickly effected.

The Committee is of opinion that in Acute General Tetanus the best method of treatment lies in the earliest possible administration of large doses of antitoxic serum by the intrathecal route, repeated on two, three or four days in succession, and combined, if thought desirable, with intra-muscular injections.

The introduction of the serum into the subarachnoid space always produces turbidity of the cerebro-spinal fluid, due to polymorphonuclear leucocytosis; this reaction is sometimes associated with transient symptoms of meningeal irritation, which need cause no alarm. With ordinary precautions the risk of septic infection is negligible.

In the Chronic Forms of Tetanus, particularly the form of localised tetanus limited to one limb, without trismus or other sign of generalisation, there appears to be no need to resort to intrathecal injection. A course of serum treatment by the intramuscular method will, in most cases, do all that is required."

7. DOSAGE IN THE THERAPEUTIC OR CURATIVE TREATMENT OF TETANUS.

"Experience has shown that in the treatment of acute general tetanus the best results are obtained from very large doses of serum; the more acute

the case the larger should be the doses of serum employed. The object is to saturate the body with antitoxin as quickly as possible and to maintain the saturation. For this purpose from 50,000 to 100,000 units may be given during the first few days of treatment.

Tetanus antitoxin is issued to military hospitals in two strengths. The weaker is put up in phials containing either 500 or 1,500 units, the more concentrated in phials containing 8,000 units. Every general hospital should have in stock a supply of the high potency serum in order that there may be no delay should a case of acute tetanus occur in the district. This high potency serum should always be employed for intrathecal injections, because this route differs from the others in the fact that the amount of fluid which can be introduced is limited. This high potency serum should be reserved for intrathecal injections alone.

The amount of cerebro-spinal fluid which can be withdrawn on lumbar puncture will not, as a rule, be more than 20 ccm. It is usually held to be undesirable to run in more serum than will replace the cerebro-spinal fluid drawn off, and in cases when little or no fluid can be withdrawn it is not wise to inject more than 20 ccm. of serum, and *this very slowly.* The 16,000 units, contained in two phials of the high potency serum, is an adequate single dose for intrathecal injection. It may be supplemented by intramuscular or subcutaneous injection.

The intrathecal injections may be repeated daily for three or four days, together with supplementary doses by other routes. When the disease shows distinct signs of abating, the dose may be decreased, the interval between the doses lengthened, and the serum given only subcutaneously.

The following outline of the successful treatment of a case may be given as an example of serum treatment in early acute tetanus :—

Day	Subcutaneous	Intramuscular	Intrathecal
1st day	—	8,000	16,000
2nd day	—	8,000	16,000
3rd day	—	4,000	8,000
4th day	—	4,000	8,000
5th day	2,000	—	—
7th day	2,000	—	—
9th day	2,000	—	—

In local tetanus, without implication of the higher centres, doses of 3,000 to 6,000 units may be given daily by the intramuscular or subcutaneous routes. But if in such cases the disease shows signs of extending to the higher centres, it is recommended to give at least one full dose by the intrathecal route.

2. *Symptomatic* treatment consists in the exhibition of sedative drugs. Morphia may be given in 1/4 (0.015) grain doses and administered every four hours; some prefer full doses of chloral hydrate; potassium bromide, chloretone or paraldehyde may also be given by the mouth or rectum.

Carbolic acid. There is no convincing evidence that the carbolic acid treatment of tetanus has any curative effect whatever, or any action upon the course of the disease. It is not recommended.

Magnesium sulphate. Treatment by sulphate of magnesium has no effect upon the disease itself. The cessation of spasm which follows an injection is only temporary, and is purchased at the cost of risks which are far from negligible. It is very doubtful if any real advantage is gained by its use. It is not recommended."

8. ANAPHYLAXIS.

"The War Office have issued a 'Memorandum on the Use of Curative Sera', which discusses anaphylactic shock, its causes and treatment. This Memorandum should be consulted by Medical Officers before treating cases of tetanus. Copies can be obtained from the D.D.M.S. in the different Commands, or from A.M.D. 2, War Office."

9. SURGICAL TREATMENT OF THE WOUND AFTER TETANUS HAS APPEARED.

"There is a general impression that it is of advantage to excise the wound, or amputate the limb in cases of tetanus. The matter is one upon

which there is considerable difference of opinion. From the clinical experiences of many observers it would seem that these procedures are of little avail and may actually accelerate the course of the disease. Animal experiment, so far as it goes, also suggests that operative measures are useless.

While more evidence is required before any dogmatic statement can be made, it appears to be safer to abstain from surgical interference with the wound until the ordinary treatment for tetanus has been carried out, unless there exist any imperative reasons for immediate operation.

When the symptoms of tetanus have subsided and the tissues are flooded with antitoxin, then the wound can be opened up and searched for foreign bodies or hidden collections of infected pus."

10. SUPPLY OF ANTITETANIC SERUM OR ANTITOXIN.

"The country generally has been divided into areas of about 10 miles radius, in each of which areas a central hospital acts as a distributing centre for serum, so that it can issue to any of the hospitals in its area, without any delay, a sufficient supply of serum to begin the treatment of a case of tetanus. The Distributing Centre indents on the General Hospital of its Command for adequate supplies of serum for prophylactic and curative purposes. Serum should be stored in as cool a place as possible."

APPENDIX A.

THE METHOD OF PERFORMING AN INTRATHECAL INJECTION.

"The patient should preferably be under general anaesthesia. The skin over the area of the fourth and fifth lumbar spines should be painted with iodine or cleansed with soap and water followed by an antiseptic. A spinal needle and syringe, or, if the gravity method be used, the usual india-rubber tubing, should be boiled in normal saline, *and the surgeon must observe throughout the most rigorous aseptic precautions.*

The patient is bent head to knees, so as to present as fully a curved back to the operator as possible, and the position of the fourth lumbar spine ascertained by drawing an imaginary line between the highest points of the crests of the ilia.

The tip of the finger is placed on the supraspinous ligament connecting the summits of the processes of the fourth and fifth lumbar vertebrae. The needle is inserted about three-eights of an inch to one side of the middle line and directed forwards and slightly upwards and inwards. If the needle strikes the bone it should be withdrawn and a fresh attempt made. The canal is reached at a depth, on an average, of about two and a half inches. The trochar is withdrawn and about 20 ccm. of cerebrospinal fluid allowed to flow out into a measured vessel. The syringe is then fitted to the needle and the serum injected. Many surgeons prefer to run in the serum by gravity, and this is undoubtedly a good method. It is hoped to supply high potency serum in glass tubes drawn out at each end, so as to make this method easier of application by those officers who desire to use it.

It is important that the serum be heated to the temperature of the body, and that the injection be made very slowly.

The canal can also be reached by pushing the needle through the supraspinous ligament in the middle line halfway between the two spinous processes.

If several injections are to be made, it is well to choose fresh sites.

Blocking of the flow of the cerebrospinal fluid by a blood clot may be overcome by reinserting and withdrawing the trochar.

The bed should be tilted at the foot and the pillow removed for an hour or two after the injections."

All the time this or any other treatment is being followed the patient himself must not be forgotten. Chloral and bromide freely,

by mouth or rectum, is part of the stock treatment; or chloretone, especially by rectum, in doses of 2.0 in 10.0 of olive oil daily.

Great relief may follow the hypodermic treatment of morphia, 1/4 grain (0.015) frequently repeated, or scopolamine. Chloroform as a sedative is only rarely indicated, and then only in extreme cases. The feeding is difficult (as is the whole general management) but must not be neglected on this account, as it is a very essential part of the treatment, and stimulants also. A very quiet, darkened room, gentle nursing and the most scrupulous care in feeding, attention to bowels, urine, back etc. and complete absence of noise or sudden shock in any way, are all very necessary, whatever treatment may be adopted.

As a last resource in desperate cases, and to feel that everything possible has been done, intravenous injections of eusol may be tried.

Locally, once the antitoxin has been freely given the wound should be opened up to allow the escape of all discharge and the thorough application to all parts of the wound of strong antiseptics, of which iodine, eusol, picric acid and cyllin are probably the most useful. If this free opening-up can be satisfactorily effected amputation is hardly ever necessary; but if it is obvious that the wound is deeply infected, e.g. if the medullary cavity of a fractured bone is the seat of the tetanus-toxin factory, a rapid circular amputation, of the bone and all the soft parts at the same level, should be done well above the affected part of the bone or wound and the stump dealt with later.

Cases of tetanus in which no wound can be found must be treated generally exactly like tramatic cases. They are usually chronic and nearly all ultimately recover.

The report on tetanus which we have detailed at considerable length throws much new light on the whole subject; but the practical application of the principles it contains can be best followed by a reference to the following epitome of the report, which I have compiled for our own use in the hospital in the treatment of any case of actual of suspected tetanus.

THE DIAGNOSIS AND TREATMENT OF TETANUS.

The following method of treatment is to be followed in future in the Hospital in all cases of tetanus, or possible tetanus, admitted to or arising in the wards.

PROPHYLAXIS. All cases of compound fractures, lacerated or septic wounds, in fact all cases in which tetanus may possibly develop, shall be given a prophylactic subcutaneous injection of 500 U.S.A. units of tetanus antitoxin on admission, and a second injection in 7 days time. In particularly suspicious cases a third or even a fourth injection may be given at 7 day intervals. The injections must be given with all aseptic precautions in the most convenient situation.

Wounds should be dressed with iodine, eusol, or permanganate, as these antiseptics are unfavourable to the growth of tetanus organisms and have the power of rendering the toxin anti-toxic.

If a recently-closed wound is admitted and operation is required at its site, a prophylactic injection of antitoxin should be given before the operation, preferably 12 hours before, intramuscularly.

DIAGNOSIS. The early diagnosis of tetanus is of the greatest importance; and all the clinical and experimental evidence shows that the chances of successful treatment diminish rapidly as the time increases from the occurrence of the first symptoms.

The usual symptoms of stiff neck, trismus and the like, are really quite late manifestations; and much earlier local symptoms in the neighbourhood of the wound must be always looked for. Thus, there may be jerking or jumping or stiffness in the affected limb, especially at night; and the muscles around the wound should be examined whenever dressings are removed and the occurrence of rigidity, or twitchings, or of local increased reflex response to gentle tapping or pressure, at once reported.

All dressers and nurses engaged in dressing wounds must report at once if the muscles round the wound should be harder or more rigid than the muscles of the uninjured limb or side.

Among other early signs may by mentioned facial spasm or paralysis, or paralysis or spasm of the eye muscles with strabismus; also spasms of the pharynx, reflex yawning, stiff neck, spasm of thoracic or abdominal muscles with complaint of stitch in the side or difficulty in micturition. Knee and ankle deep reflexes may be increased and the patient may have a generally drawn expression, from general increase in tone of the facial muscles, and he may be irritable and sleepless. There may also be profuse local or generalized sweating, which is evidence of a generalized tetanic toxaemia.

The classical symptoms of the disease are usually present, however, on the patient's admission to Hospital; and, once the diagnosis is established, the patient should be examined as little as possible,

THERAPEUTIC OR CURATIVE TREATMENT OF TETANUS. Time is the all-important element in the treatment of tetanus and as short a time as possible should be allowed to elapse between the diagnosis and the commencement of active treatment. A delay of an hour may make all the difference between success and failure.

The moment, then, that any local manifestation of tetanus is observed, or the symptoms are quite clear, vigorous treatment must be started at once. The best method of treatment lies in the earliest possible administration of large doses of antitoxic serum by the intrathecal route, repeated on two, three or four days in succession, and combined, if thought desirable, with intramuscular injections.

In acute general tetanus the best results are obtained from very large doses of serum and the more acute the case the larger should be the doses. The object is to saturate the body with antitoxin as quickly as possible and to maintain the saturation. For this purpose from 50,000 to 100,000 units may be given during the first few days of treatment.

The antitoxin is introduced like a stovaine injection, the patient, however, lying curled up so as to make the back as curved as possible. About 20 c.cm. of cerebro-spinal fluid is allowed to flow out into a measured vessel and then the syringe, already charged with the antitoxin, is fitted on and its contents slowly injected. The serum must be warmed to body temperature and when several injections have to be made it is well to choose fresh sites. The bed should be tilted at the foot and the pillow removed for an hour or two after the injections.

16,000 units may be injected by this route on each of the first two days, and then 8,000 units for the next two days; and these amounts may be supplemented by intramuscular or subcutaneous injections of 8,000 for the first two days and 4,000 units for the next two. When the disease shows signs of abating the dose may be decreased, the interval between the doses lengthened, and the serum given only subcutaneously. In local tetanus without generalised symptoms, doses of 3,000 to 6,000 units may be given daily by the intramuscular or subcutaneous routes.

In addition to the specific treatment by antitoxin, symptoms must be treated by sedatives, as necessary; and particularly by hypodermic injections of morphia frequently repeated, chloral or bromide by mouth or rectum, chloretone and paraldehyde.

The nursing is all important also and all the general regime hitherto followed in the Hospital for these distressing cases must be strictly observed.

Recent experience has shown that no curative results follow the

treatment by subcutaneous injections of carbolic acid or intra-thecal administration of sulphate of magnesia.

SURGICAL TREATMENT OF THE WOUND AFTER TETANUS HAS APPEARED. No operative interference should be permitted in a wound while the treatment of tetanus is being carried out, unless it is absolutely necessary. Everthing must be done, however, to improve the condition of the wound by treating it very thoroughly according to our usual routine management of septic wounds and especially by dressing it with the antiseptics previously mentioned.

Amputation should never be done during the acute stage of tetanus, unless it seems well to do so in the hope of removing the focus of tetanus infection. This may be wise when, for instance, there is a very septic wound opening up the medullary cavity or the cancellous tissue of a bone. Even in these cases the toxin has already entered the circulation or become disseminated along the nerves and too much improvement must not be expected. When the symptoms of tetanus have subsided and the tissues are flooded with antitoxin, then the wound can be opened up and searched for foreign bodies, or hidden collections of pus and tetanus bacilli, or any other necessary surgical operation performed.

RECORDS OF CASES. A careful record of symptoms and treatment must be kept by the House Surgeon on the patient's observation sheet in all cases of tetanus ; and the fact of the prophylactic injection on admission and injections later must be written on the bed-ticket.

HYDROPHOBIA Our experience of dog-bite from healthy and rabid animals is very extensive but, thanks to the system of collection and isolation of cases and the excellent work done by the Anti-rabic Institute, hydrophobia is happily comparatively rare. All dog-bites and bites of any other possibly infected animals---among which may be included cats, donkeys, wolves, camels, horses and even foxes—are at once sent to hospital for treatment, and go through a rigid course of injections at the Institute. During 1914, 531 cases were treated and 11 (2.07 %) died; but 5 of these deaths occurred either during the period of treatment or less than 14 days after its termination. These deaths were all in persons with severe bites which, with one exception, were multiple. Two were cases of wolf-bites and two were bitten on the face.

Anyone who has ever seen a case of hydrophobia will need little urging to insist on every case of dog-bite, or bite of other possibly infected animals, being submitted to a full course of anti-rabic inoculations, unless it can be quite definitely proved that the animal was not,or is not,suffering from rabies. I have seen a fatal case in whom symptoms did not develop till six months after the bite, when, indeed, it had been quite forgotten.

Recent work at the Anti-rabic Institute in Cairo shows that most bites occur in March and June and fewest in October. Further, only 25 % of cases bitten by a rabid animal develop hydrophobia. The mortality from hydrophobia is 1 in 6 among the uninoculated and 1 in 700 among the inoculated. These are the figures for dog-bites, but in the case of wolf-bites, the rates are respectively 1 in 1.6 and 1 in 15. The general mortality of all Pasteur Institutes is 7 per 1000, which is also the average in Cairo where the statistics show that since the inauguration of the Institute in 1906, 6614 cases have been treated, but in many cases the animal was proved not to be mad.

Of 5625 completed courses of injections, there were 4813 dog-bites, 273 bites from cats, 94 from foxes, 71 from wolves, 19 from monkeys, 19 from donkeys, 5 from jackals, and 99 from other animals including camels and horses.

GONORRHOEA among the native-born Egyptian fellah is comparatively rare. It does exist, however, and on the whole runs a rather mild and uncomplicated course. Thus stricture of the urethra is nearly always bilharzial or post-operative in origin and not gonorrhoeal. One must always be careful to exclude bilharziosis of the urethra in case of a discharge from the meatus, though the diagnosis of gonorrhoea can soon be made from the progressive character of the symptoms and the microscopical examination of the discharge. Uncharitable though it may sound, any case of acute urethral discharge, in whatever rank of life it occurs, must be considered gonorrhoeal, until the microscopical examination and the clinical history of the case prove it otherwise.

The average student has a very vague and disconnected idea of the TREATMENT OF GONORRHOEA in general. As this disease will certainly come under his notice at an early stage of his professional career, and may be fraught with very serious consequences, both for the patient and his future wife, I propose here to describe my usual practice in such cases, as I am sure it will prove useful to the young Egyptian graduate. It can only form a basis of a scheme of treatment, as individual cases may require special methods which are quite beyond the scope of the ordinary practitioner.

Certain GENERAL MEASURES are taken in all acute cases or even in suspected cases. Alcohol in any form is absolutely forbidden. Bland fluids must be given in large quantities, especially water, barley-water, maize-water (Ar. Maʿ Shawash-el-dourah ماء شواشى الدره), soda water, Vichy (Celestins) or Evian water. Sodium bicarbonate 30.0, sodium salicylate 10.0, to 1 litre of lemonade and drunk freely between meals is also excellent (Luys). This excess of fluid often acts as a flush and keeps the inflamed urethra as little irritated as possible.

As regards diet, all meat should be stopped during the acutest period, and a strictly milk diet should be advised. All very acid or salty dishes, asparagus, tomatoes, game, lobster, prawns etc., in fact anything likely to produce constipation or to irritate the urinary tract in any way, must be avoided.

A suspensory bandage should be worn to support the testicles ; and a gonorrhoea bag, with antiseptic wool in it, placed round the end of the penis and tied with tapes round the waist and the wool frequently changed. Frequent washing of the glans, prepuce and meatus with 1-5000 potassium permanganate solution is ordered and great care must be taken to rinse the hands in lysol solution after the washing, to prevent the possibility of infecting the eyes or other parts or persons. Warm baths are good and local baths, by frequently soaking the penis in a cup of hot water or weak permanganate lotion (1-1000) for a quarter of an hour at a time several times a day.

Rest, as much and as absolute as possible, should be enjoined, and no cycling, riding or excessive exercise, or even walking, should be permitted. It would seem almost an unnecessary piece of advice to give, but in practice it *is* necessary to forbid any sexual intercourse or excitement until the disease is entirely cured.

Sandal-wood oil capsules (0.60) should be taken three times a day, or oftener if the digestion will stand them. This drug is especially liable to

produce indigestion, and, personally, I generally order eumictine, two capsules four times a day. This is a combination of urotropin and of santol. A little later, a mixture of buchu and hyoscyamus may be given as a change, with the following formula :---

Citrate of potash	1.0
Tincture of hyoscyamus	1.50
Syrup of orange	2.0
Infusion of buchu to	30.0

This is given four times a day, and has a good diuretic effect. Urotropin 0.40 and salol or salicylate of soda (0.30) may be given, in a cachet, four times a day also.

If phosphates become excessive acid sodium phosphate in 1.0 doses, in water, four times a day, or the benzoates in appropriate doses should be given ; and throughout the whole treatment the bowels must be kept well regulated.

For painful erections, bromide of camphor, 0.50 in cachet, given in the late afternoon, at bed-time, and again during the night, if need be, is often very effective; and, in very severe cases, an enema, containing 1.0 of tincture of opium and 1.50 of antipyrin in warm water, with cold compresses to the penis should be tried.

LOCAL TREATMENT. The treatment likely to prove successful in gonorrhoea is a sensible and persevering local treatment.

The necessary skill in giving anterior and posterior urethral irrigations by Janet's method—without a catheter—comes only with practice; and for the details of this method as well as for an excellent account of gonorrhoea in all its aspects, I must refer you to Luys' "Gonorrhoea and its complications", the English translation of which is by Foerster.

The patient may seek advice with a very short history of two or three days and show a red inflamed meatus with slight irritation on micturition; and if you are fortunate enough to see him thus early, a vigorous, local *abortive treatment* may prove entirely successful, or so modify the subsequent progress of the case that its treatment becomes a comparatively easy matter. This abortive treatment consists almost entirely in the repeated irrigation, first of the anterior and later of the posterior urethra also, with hot permanganate solutions in large quantities, two litres at a time. Janet advises irrigations of 1-1000 permanganate, but I prefer to use a weaker solution of 1-10,000 and work it up progressively to 1-4000. If the patient is in a position to rest and devote the whole of his time to his treatment, he may be given an irrigation of the anterior urethra with 1-10,000 solution three times a day; but in most cases this is quite impracticable and twice a day is usually all that can be managed. After the third irrigation the whole length of the urethra should be irrigated, the fluid being injected right into the bladder and then passed by the patient.

These irrigations should be continued steadily with increasing strengths for a week ; and, if the discharge is distinctly lessened and the improvement generally quite evident, they may be continued till all discharge ceases. But if they appear to be producing an increased irritation

and the acuteness of the condition continues or even increases, they must be stopped and all injections given up for some days. The abortive treatment has failed.

Other forms of abortive treatment as, for example, by the injection of strong silver nitrate, are, in my opinion, not to be recommended.

In practice, unfortunately, one does not often see cases at such an early stage, the victim generally waiting a day or two to see if the discharge will stop of itself. When at length he comes for advice, he has already passed the stage at which abortive treatment might have done him good.

It is now *a well established case* of gonorrhoea, and we must first push all the general treatment and regime and for the moment do nothing in the way of injections or irrigations. We try and make him flush himself out from above, by increasing the quantity of his urine and rendering it as non-irritating as possible. Frequent washings of the glans and meatus with permanganate, and local soaking of the penis, as already described, must be carried out and saline aperients freely given.

When the acuteness has, to some extent, subsided, irrigations with permanganate of the whole length of the urethra must be given, twice a day if possible, and certainly once a day, in precisely the same manner as in the abortive treatment and in the same proportions. The anterior urethra is always washed first till it is quite clean, before the fluid is allowed to pass into the posterior urethra and bladder. Oxycyanide of mercury 1-4000 may be used as a change from time to time.

During the course of the treatment all irrigations should be stopped for a day or two from time to time to see what has been the result of the treatment.

If, after 14 days, very little discharge remains, this may be cleared up by the use of injections given by a urethral syringe. The most generally useful drugs are nizin (a zinc salt of sulphanilic acid), sulphate of zinc or sulphocarbolate 1-200, permanganate of zinc 1-4000, picric acid ¼ %, or protargol 1 %. These injections should be given three times a day and, in giving them, the patient should be instructed to pass water first, then to wash out the anterior part of his urethra with warm water injected from the syringe. He then injects the lotion and allows some of it to run away and finally injects another syringeful and holds the fluid in for 3 or 4 minutes. If there is any severe irritation after the injection, he must pass water again as soon as possible to relieve it. These injections do not generally reach the posterior urethra but are often effective in finishing off a rather lingering discharge in the anterior part, and should be followed by a few more irrigations before a test of cure is made.

In favourable cases under irrigation, perhaps combined with injection, the discharge stops and the urine clears in from 3-4 weeks, and everything seems all right. An injection should then be made into the deeper portion of the urethra, through a soft catheter, of 5 c.c. of a 1 % solution of silver nitrate and the resulting discharge of the following morning carefully examined microscopically for gonococci. If the pus is free of gonococci, a few more irrigations may be given and the case considered cured, if a further test is still negative; but if they still persist,

the irrigations and the whole treatment must be continued until the test gives a negative result or until a condition of chronic gonorrhoea results, when much more vigorous measures will become necessary.

A distinction must be made between *anterior* and *posterior urethritis*; but, as in anterior, in acute cases, in over 80 % the posterior urethra is also affected, treatment must be directed as described above to the whole length of the urethra; and the progress must be gauged by the discharge, the presence of threads and mucus in the urine, as passed in two or three glasses, and the microscopical examination of the discharge or of the centrifugalised deposit of the urine.

If, however, an *acute posterior urethritis* persists and declares itself by a thick turbid urine in the last glass, with very little discharge from the meatus if *only* in posterior urethra, frequency and difficulty of micturition, and sometimes terminal haematuria, irrigations along the whole length of the urethra must be patiently continued; and, when the acuteness has gone off, the prostate massaged every two days to express the infected secretion from its follicles, as is so constantly necessary also in *chronic* cases affecting the posterior urethra.

This prostatic massage is carried out as follows:— The patient makes water first and is then given a urethro-vesical irrigation until the returned fluid is quite clear. The bladder is then filled up with water or boracic solution and the patient stands firmly but bends well over and supports his arms on a table. The surgeon then introduces his gloved finger into the rectum, palpates the prostate thoroughly and, if it is not acutely tender or inflamed, proceeds to massage it by rubbing with the index finger from above downwards and from without inwards along the body of the organ. By making pressure on the abdomen with the left hand the massage is more easily performed. After the massage, the patient empties his bladder into four glasses and the last one will show the amount of debris and secretion expressed from the prostate. This must be examined microscopically to confirm the presence of gonococci. This prostatic massage is often very painful and must be done very gently at first; but later it is much more easily borne and much benefit generally results.

In addition to the irrigations and prostatic massage, rectal suppositories of mercurial (blue) ointment 1.50 in cacao butter, may be introduced every evening at bed-time, and hot rectal irrigations and hot baths also given. Urotropin, in doses of 0.50, four times a day, should also be prescribed.

Even with all this care it often happens that posterior urethritis becomes a chronic condition and can only be cured by even more vigorous methods. The only real evidence of cure will be a perfectly clean urine in all glasses, a complete absence of symptoms and of pain on palpation of the prostate, and the absence of gonococci in the expressed secretion of that organ or in the centrifugalised deposit in the urine.

Sometimes the first conclusive evidence of the existence of a posterior urethritis is the appearance of an EPIDIDYMITIS, which rapidly

becomes worse in the course of two or three days, spreads to the testis and then runs the usual course of this very painful and troublesome condition. It is due to a direct infection from the prostatic urethra along the canal of the vas deferens. In acute cases it may come on quite unexpectedly without any premonitory symptoms, or be preceded by an acute prostatitis. It also occurs in chronic cases, after the too vigorous use of dilators, or too active treatment with silver nitrate in deep urethra; and, also, as a complication of chronic prostatitis.

The symptoms are the same however it originates; and immediately on its appearance all sounding or other form of intra-urethral medication must be stopped, as also prostatic massage, and not resumed until all the acuteness of the epididymitis has entirely gone. Irrigations are the only form of local treatment that can be continued; and the patient must be put to bed at absolute rest, with the scrotum well raised, and have ice bags applied to it and constantly repeated. After a day or two hot fomentations or antiphlogistine can be substituted, and, later, various soothing ointments of belladonna or mercury, and finally rubbing with vasogen iodi 6 %.

The pain may be so severe that morphia hypodermically may be necessary, and internally, other sedatives are ordered. Sodium salicylate in 1.0 doses four times a day has often a very good effect and lots of non-irritating drinks are indicated to soothe the posterior urethra from whence the disease came. The pain and swelling gradually get better, but may leave a hard knot or thickening in the epididymis or cord which may last for months. Sometimes one side is affected after the other, and in this case there is grave risk of sterility from blocking of the canal of the vas and the absence of spermatozoa in the spermatic fluid.

After the attack is over, treatment must again be directed to the posterior urethra; and sometimes after an epididymitis, the urethral condition seems to clear up more rapidly.

Epididymitis is usually preceded by an acute or chronic PROSTATITIS, and this may go on to the formation of an abscess in the peri-prostatic tissues. The ACUTE PROSTATITIS is treated with rest, hot rectal irrigations, suppositories of morphia and belladonna, leeches to the perinaeum and, later, hot fomentations or poultices, hot baths etc. If an abscess forms it must be opened, whenever possible through the perinaeum, or, if it is presenting prominently into the rectum, the incision may be made in that canal, and, as a rule, the opening soon heals if kept clean by repeated saline or permanganate rectal irrigations. Sometimes the abscess bursts of itself into bladder.

CHRONIC PROSTATITIS calls for repeated massage, permanganate urethro-vesical irrigations, fomentations to the perinaeum, fluid drinks, urotropin and suppositories as before mentioned. When the urine is clear again, dilatation with curved metal sounds, massage and, later, urethroscopic treatment are necessary.

Of the other *complications* of gonorrhoea, phimosis, paraphimosis and inguinal buboes are the most commonly met with and must be treated on general principles. Gonorrhoeal cystitis, pyelonephritis and

pyelitis are fortunately rare and, besides the recognised treatment for these conditions in general, are sometimes much benefitted by autogenous vaccines. Gonorrhoeal rheumatism in its various forms, and all the many other unusual complications, must be studied in the ordinary text books as they are very rare in Egypt. Gonorrhoeal purulent conjunctivitis is beyond our scope.

THE TREATMENT OF CHRONIC GONORRHOEA OR GLEET. This is on an entirely different footing from that of the acute condition and often severely taxes the resources of the most skilful specialist. The disease is now an entirely local one and requires topical treatment to the affected spot. For this purpose a knowledge of urethroscopy is essential and the necessary dexterity to carry out certain stimulating applications through the urethroscopic tube. When one realizes that chronic gonorrhoea may be due to retained gonococci in any part of the mucous membrane or its follicles, or in the prostate, seminal vesicles, Cowper's or Littre's glands, the magnitude of our task can be imagined.

Personally, I generally proceed as follows, making a diagnosis and drawing conclusions after each stage of examination :—

The meatus is first examined for discharge and the urine passed into three glasses and carefully examined for threads or mucus. Enquiry is made if there is any sore spot noticed during micturition. An olivary-headed bougie is very gently and slowly passed into the bladder and note taken of any painful spots, constrictions or strictures, and their distance from the meatus, on the way in ; and these are again checked as the bougie is withdrawn. I then pass a series of metal sounds and gently dilate the urethra as much as possible without causing pain. This is followed by a urethro-vesical irrigation of permanganate and then the bladder is filled up with plain water and the prostate palpated and massaged. A tender patch is often felt in the prostate or one or both lobes may be inflamed and tender. The contents of the scrotum are also examined. The bladder is then emptied into three or four glasses and the secretion examined. A microscopical examination is not usually done at this stage as in most cases it is quite obvious that a long course of treatment, including massage of the prostate, must be adopted, and the examination is deferred till there is more chance of a negative result. In inveterate cases we may even have to employ expression of Cowper's gland with the index finger in the rectum and the thumb on the perinaeum ; and also of Littre's glands, by massage of the pênile portion of the canal on to a short straight sound in the urethra.

The regular *scheme of treatment* now resolves itself into repeated urethro-vesical irrigations with increasing strengths of permanganate, regular and increasing dilatation with metal sounds, sometimes even with special (Kollman's) dilators, repeated massage of the prostate, and occasional injections on to sore spots, through a soft catheter or urethroscope tube, of 1 % solution of silver nitrate or even up to 2 %. As a final part of the treatment, when everything else has been given a good trial, or during the course of treatment, a very careful examination must be made with the urethroscope and sore spots touched or infected follicles cauterised with fused silver nitrate on the end of a fine probe,

These intra-urethroscopic operations must be repeated after a few days and in this way, very often, a large number of infected follicles can be destroyed in groups.

Sometimes considerable benefit may follow the judicious use of *vaccines* and my experience of this method has been published in the Lancet of August 7th 1915, and may be appropriately included here.

"Gonococcic vaccines have been much used, but I must candidly admit that in my hands the results have been very disappointing when the gonococcus is the principal infection. Stock vaccines are generally tried, but are destined to failure. In acute gonorrhoea vaccines are contra-indicated, for as much phagocytosis as is possible is going on already, and the only effect of a vaccine would be to produce a violent reaction which may have very serious consequences. In chronic gonorrhoea, pure gonococcus autogenous vaccines are rarely of much value, and no dependence at all can be placed on *stock* vaccines, unless combined with staphylococcus and streptococcus vaccine also. When an autogenous vaccine is made from the urethral discharge and from the early morning urine it is surprising how many organisms other than the gonococcus are found in the cultures. The commoner groups are the septic organisms, especially the staphylococci, a short bacillus, a diphtheroid bacillus, diplococci of various sizes etc., and to be of any use a mass vaccine, to which is added a further quantity of a pure gonococcus culture, must be made.

Such a mass vaccine may be of use in chronic gonorrhoea, producing rapidly an improvement, both clinically and bacteriologically, the few gonococci that are ultimately left dying out or becoming cast off by epithelial cells or leucocytes, till eventually a cure is effected. These vaccines are, however, much more useful in the presence of local complications, such as cystitis, urethritis, pyelitis, prostatitis and epididymitis. One must always remember the dictum of Ricord that "one knows perfectly well when a gonorrhoea begins, but it is the privilege of God to be able to tell when it will end." This admission from such an acknowledged master of this part of the craft of surgery, sufficiently indicates the necessity for the constant and thorough application of all the many forms of local treatment and the unwisdom of placing too much reliance on vaccine injections.

All difficult cases of gonorrhoea must be submitted to a thorough course of vaccines, the progress of the treatment being gauged by repeated bacteriological examinations at short intervals. To illustrate the difficulty of preparing an appropriate vaccine for these chronic urethral infections I would like to give you a short list of the different organisms found by Dr. Ferguson in a recent series of cases. Among others the following were found : Gonococci in various stages of development, some inside the leucocytes, others free, some in epithelial cells, or entirely extra-cellular, some freely multiplying, others old and mature; staphylococci of all kinds; short coli-like bacilli ; pneumococcus-like cocci ; less definite diplococci, larger than gonococci and Gram-positive ; diphtheroid bacilli ; short stout bacilli. One of the most recent cases yielded very few extra-cellular gonococci, short stout bacilli, staphylococci, and diplococci (Gram-positive). A mass vaccine gave very good results in the ureteritis and pyelitis, for which treatment was sought, combined with steady dilatation of a constricted posterior urethra.

The last case worthy of notice was one of old gonorrhoea of ten years' standing, which yielded finally to very radical local treatment. Recently he started a fresh urethral discharge which, on examination, consisted entirely of epithelial cells, and an almost pure culture of a diphtheroid bacillus. No leucocytes or pus cells were present, but the epithelial cells were packed with the diphtheroid bacillus. A steady course of large irrigations of bladder and urethra by Janet's method with 1-10000, reduced gradually to 1-5000, perchloride of mercury solution proved effective, and the final *coupe de grace* was given by oxycyanide of mercury in similar strengths.

To sum up, the vaccine treatment of gonorrhoea is not to be thought of in the acute stages of the disease ; but in chronic gonorrhoea a mass vaccine is sometimes useful in clearing up an old urethral discharge, and is quite good in the local complications of the disease. No vaccine can be expected to be of any benefit unless it is combined with vigorous but kindly local treatment, in which the topical application of nitrate of silver and other cauterising drugs to the sore places and follicles, through a urethroscopic tube, finds a prominent place."

I cannot better conclude this review of the treatment of chronic gonorrhoea than by quoting Luys and his conclusions as follows :--- "The therapy of chronic urethritis should always be based on the same general plan. In the beginning urethro-vesical irrigations diminish the intensity of the inflammation. As soon as possible one combines them with massage of the glands connected with the urethra (prostate, seminal vesicles and Cowper's glands). When all acute inflammatory symptoms have disappeared, slow methodical and far-pushed dilatation of the urethral mucous membrane is indicated. Once it has reached a certain degree, urethroscopy can be applied without difficulty. It enables one to tell if there are any diseased patches left which require special treatment (dilatation of the highest degree). Once the latter has done its duty, a new urethroscopic examination is necessary, and on the finding that it yields will depend the choice of further treatment (intra-urethral applications, cauterisation etc.) This therapy undoubtedly requires a long time for its application but this is the only grievance which one could have against it ; for one may say that it leads to a certain and lasting cure. One should know when to stop treatment, i.e. when the oozing from the urethral mucous membrane is absolutely clear and when the urine contains no longer any filaments. One should never resort to one of the methods mentioned above exclusively and rely on it alone. Very generally one should combine several of them and use them simultaneously. One seldom meets with a case of chronic urethritis with only one diseased focus. As a rule, the lesions of chronic urethritis are multiple. One of the most important rules demands that one should occasionally interrupt all local treatment and give the patient a complete rest for a time.

Lastly, one should not confine oneself to *local* therapy. The general health of the patient also deserves consideration."

Gonorrhoea in women hardly comes within the scope of the present volume.

A series of lectures on the diseases of the male urethra by Mr. Frank Kidd, published in the British Medical Journal during January 1917, may be referred to for further details of the modern treatment of gonorrhoea, and the electric treatment and other special procedures can be studied only in the actual practice of the hospital.

SYPHILIS. The account of this disease here given is a revised version of an article I had published in a special Syphilitic number of the Practitioner in July 1904, to which an account of the modern methods of diagnosis and treatment has been added.

In Egypt many circumstances combine to make syphilis a terrible scourge among the lower classes of the native population. The fatal tendency to accept whatever happens as the expression of the will of Allah, and, therefore, inevitable and unavoidable, and the spirit of "ma'alishness" (1) that follows as a necessary result of this belief ; the deep-rooted objection to treatment by a medical man, and the faith from time immemorial in the power of the sheikh, or the holy man, to charm away disease; and, above all, the astounding ignorance and indifference of the whole agricultural population in matters of general cleanliness and sanitation: all these and many other similar factors make up a formidable list of disabilities, against which one has to contend when called upon to treat a case of syphilis in a native of Egypt or the Sudan. The excessive heat of the summer, and its dampness at the time of the Nile flood, seem to provide just the requisite temperature and moistness of the skin for the richest development of the syphilitic manifestations; especially as, owing to neglect, the protection afforded by early and energetic mercurial treatment is so conspicuous by its absence.

As we go further south towards the Equator, and the disease affects the almost uncivilised black races, its ravages become worse and worse, and the power of resistance, never well developed in these people, seems to be completely broken down by the syphilitic virus.

A knowledge of the Egyptian belief as to the origin and transmission of syphilis does much to explain the difficulties with which one meets in its treatment. For an account of these beliefs, which have much vogue even at the present day, I am indebted to my late friend and colleague, Dr. Bayoumi Fathi, formerly Assistant Ophthalmic Surgeon to Kasr-el-Ainy Hospital.

In the days when the world was yet young, before even Noahwas, there lived a certain prophet named Ayoub (Arabic 'Saidna Ayoub', سيدنا ايوب English, Job) who provoked the displeasure of Allah ; and, as a punishment, Allah gave him syphilis. The disease thus given to Ayoub was transmitted by him to his descendants, and from them to the rest of the people. Even now the expression "marrad Ayoub", the disease of Ayoub, is a common synonym for syphilis ; and as it came originally as a gift from Allah, no treatment is likely to be of any avail, if, indeed, it is not utterly wrong to attempt anything of the kind. Sufferers from syphilis were isolated from their families and kept in the mountains, to have the full benefit of the desert air and the sun, for six months.

(1) The Arabic "ma'alish" is best translated "Do not worry", and is practically synonymous with the Scotch "Dinna fash yersel' ".

PLATE 11.



The Torment of Job. From an old print, published in Burroughs Wellcome's Catalogue.

Syphilis thus dates much further back than leprosy, though the latter disease is specially mentioned by Mohammed (a comparatively latter-day saint as compared to Ayoub) in the Hadith, in whose pages he exhorts the faithful to keep as far away from a leper as possible.

Although syphilis has existed from time immemorial in sporadic form, it did not assume epidemic proportions until it was disseminated throughout the whole length of the land—we cannot speak of the breadth of the land in Egypt—by Napoleon's soldiers. Since that time, and probably from the times of the Crusaders, who also brought the disease to Egypt, it is commonly known as the "marrad affrangi", or the disease of the Franks, that being a general term applied to all foreigners who are "unbelievers".

In earlier days all sores about the genitals, and even gonorrhoea (Ar. sayalan سيلان) were classed together as syphilis ; and even now the dual nature of venereal sores is only partially recognised. The primary syphilitic sore is very often completely ignored, as being hard and painless, or it is looked upon as a form of Nile boil and thought nothing of. The appearance of the secondary eruption is usually attributed to fright, and the patient generally has a plausible story, which, from constant repetition, even he himself comes in time to believe, that "he was frightened in the darkness of the night".

It is recognised that the child of a syphilitic father will be born to syphilis. Further, young babies, of possible syphilitic parents, are never washed for the first year, for fear lest syphilis should be attracted by the clean skin and infect the child, an event not likely to occur if it is left in all its natural dirtiness. It is not surprising under these conditions that ophthalmia, and other filth-diseases, are so common in Egypt.

The almost universal opinion among the country people is that syphilis should never be treated medicinally ; for even if it is, the disease only disappears for a time to reappear in a much more virulent form in some other part of the body. If a bad case of syphilis is seen, the people at once say "That case has certainly been treated, and what else could one expect in those circumstances ? " or words to that effect.

CERTAIN SPECIAL CHARACTERISTICS OF SYPHILIS IN EGYPT.

PRIMARY LESIONS. Chancres on the male gential organs occur at all the usual sites, and many cases become *phagedenic,* unless they are taken in hand at once and energetically treated. In nearly all cases, and certainly in all hospital out-patients, such is the filth with which chancres are both locally and generally surrounded, that it is advisable to admit all these patients to hospital, where frequent hot baths are insisted upon. The phagedenic sore is freely cauterised with pure carbolic acid, or acid nitrate of mercury, and then dressed with eusol fomentations and later with blue or ammoniated mercury ointment. General treatment is at once started ; and to attain anything like a good result the case must be seen and dressed personally every day until the sore has completely healed, the constitutional treatment being at the same time persevered with.

In severer cases even more energetic measures must be employed and it is sometimes necessary to scrape away the whole ulcerated surface with a sharp spoon and then apply strong antiseptics as above. A spreading cellulitis of penis and groin, with septic inguinal lymphadenitis is sometimes met with, and requires free multiple incisions, drainage and the application of eusol fomemtations. Not infrequently the first view of the case shows us very extensive phagedenic destruction of the penis, and, after a long course of treatment, when all the sloughing has ceased, the organ is truly but a relic of its former self and the scrotum is also much destroyed.

These extreme degrees of phagedena are not to be wondered at, seeing that the popular dressings are powdered Nile mud, the outer skin of an onion, or, more often, green leaves from various trees famous for their healing properties.

With all this local sloughing there is, as a rule, remarkably little general disturbance.

In *females* the only genital chancres I have noticed have been just within the vaginal orifice; and commonly enough they are discovered, so to speak, accidentally, the patients seeking advice for a secondary eruption.

Extra-genital chancres are common, the most usual sites being the lips and the mucous membrane of the mouth. I have seen one case on the tongue, and during the last year, one on the index finger of a woman. It is always difficult to trace the mode of origin of these extra-genital sores ; but in one case, there was distinct evidence of infection from kissing a syphilitic woman who was suffering from mucous patches at the time.

It would seem difficult at first sight to account for the presence of a *chancre on the abdominal wall,* midway between the umbilicus and the pubes; but remembering the habits of the people, it is evident that such chancres arise from an infected razor, it being the custom to shave the pubic hair. I have seen three cases of this nature, but have never seen a chancre on the scalp, which among certain classes, is usually kept just as carefully shaven.

In spite of the very common custom of *tatooing* in Egypt, I have never seen a chancre produced in this way; but I have a very vivid recollection of a typical hard chancre on the chest of an English sailor who had been tatooed in Java. A beautiful dragon, belching forth flames of fire, had been depicted in glowing colours on his chest; but the vividness of the flames was in a state of partial eclipse, owing to the presence of a very characteristic syphilitic chancre in their midst. The glands in each axilla were enlarged and shotty.

In Egypt there is another variety of extra-genital chancre which is unfortunately occasionally seen. It is situated in the folds of the mucous membrane of the rectum, immediately within the anus, and is associated with enlarged glands in the groin below Poupart's ligament on one or both sides. The appearances of such a chancre, which is due to infection from *the results of unnatural vice,* are very characteristic. The subject is always a young boy, with (usually) a deep depression

round the anus, due to absorption of the fat in the ischio-rectal fossa. The sphincter ani is relaxed and the mucous membrane is everted and fissured all round; the edges of each fissure being thickened and whitened, and the depths ulcerated. The whole circular chancre is usually in sight on slight straining, and there is no marked induration of the mucous membrane. In tropical countries generally, and, in other countries where such practices exist, the possibility of a chancre in this situation must be remembered, as, if the history cannot be elicited, considerable difficulty may be experienced in the diagnosis. Such cases, in addition to constitutional treatment, are best treated locally with suppositories of calomel-ointment and the application of a dusting powder of starch and calomel externally.

Phagedena never appears to occur on extra-genital sores, though a condition much resembling cancrum oris may be met with about the lips and cheeks.

SECONDARY MANIFESTATIONS. In the absence of treatment for the primary chancre the secondary lesions are naturally very severe. The earlier *rashes* show as darkly-pigmented spots on the saffron skin of the native Egyptian. Usually there is no difficulty in diagnosing a syphilitic rash, the dark pigmented appearance about each individual spot being quite unlike any other eruption; and, though it may sound absurd to say so, the spots on a negro are a darker black than the rest of the skin, and they commonly have a small scaly top, which is very characteristic of the later secondary rashes. In one particularly severe case of secondary rash a well-marked papule was seen on the ocular conjunctiva.

Condylomata flourish in truly tropical luxuriance. Large masses are constantly seen round the genital ograns and anus in both sexes; but they thrive on any moist part of the skin surface. Thus I have seen them in the umbilicus; in the folds of the groin below and above Poupart's ligament; in the folds of the skin of a fat abdomen or chest wall; under the folds of the pendulous breasts; in the axillae; in the folds of the neck; in the external auditory meatus on both sides; and also on the palpebral conjunctiva beside the lachrymal duct.

The treatment of condylomata, whatever their position, is the same, regular constitutional treatment, and the application of calomel and starch powder, or aristol and starch locally, the parts being thus kept as dry as possible. Sometimes large masses have to be completely excised.

Mucous patches are also common, but present no special factors of interest. *Alopecia* is frequently found, but secondary lesions in other parts of the body are rare. Later *reminders*, in the form of leucoplakia on the mouth and tongue, syphilitic palmar psoriasis and dry scaly patches on the legs are frequently seen; but rupia and serpiginous ulcerations are not common.

TERTIARY MANIFESTATION. Probably the most usual effect of tertiary syphilis in Egypt is a gaping ulceration involving the upper lip, the hard and soft palate, and the nose. The nasal fossae are opened up and the greater part of the skin over the upper jaw is completely destroyed; while, backwards, the ulcerative process extends to the pharynx and

even on to the larynx. Such is the destruction wrought in the larynx and its cartilages that many patients are entirely dependent upon a tracheotomy tube for respiration. A short time ago it was necessary to procure a fresh supply of tracheotomy tubes for the hospital, the old supply being exhausted in permanent loans to the out-patients.

Gummata frequently occur singly in the hard or soft palate, limiting their destructive effects to these parts and the adjoining tonsils and uvula ; but, except for an occasional well-marked case on the scalp and skull, gummata in other parts of the body are not at all frequent.

The destructive effects of tertiary ulcerations is much more marked in the blacks than in the native Egyptian ; but, all things considered, tertiary syphilis is not nearly so common as one would expect. Professor Symmers, formerly Pathologist to the Hospital, in an experience of over 3,000 autopsies, is of opinion that tertiary syphilis of the internal viscera and of the central nervous system is very rare, though he has met with isolated examples of almost all the typical lesions. It seems as if the disease burnt itself out in its primary and secondary stages. Malignant disease (epithelioma) implanted upon old tertiary ulcerations *does* occur, but in quite a comparatively small proportion of cases.

TREATMENT. In *earlier days* the primary chancre, not being at all recognised as such, received no treatment whatever; but, on the appearance of the secondary manifestations the patient was isolated, as already mentioned, and was put upon an extremely low and non-stimulating diet. Thus for forty days he was not allowed to taste any salt, milk or meat, his only source of sustenance being thin cakes made of flour and water. It was not thought worth while to apply to the Sheikh for a charm against this disease, as it was a gift from Allah, and as such had to be borne with fortitude and equanimity. At a later period, and even now, great faith was and is placed in the infusion of sarsaparilla--the Arabic "aieshbah" (عشبة). Certain rules must be observed by a patient undergoing the aieshbah treatment. Dr. Gorgy Sobhy, Assistant Professor of Anatomy, thus describes the regime :—"A person who enters the sarsaparilla—to translate the Arabic expression quite literally—must be clean in mind and body, and eat nothing but fowls. He must live in a pure and bracing air and never hear any word that may aggrieve him. He must take the infusion of sarsaparilla regularly, or not at all, and must be cheerful in both body and mind. When the period allotted to him has passed he must very gradually return to his former customs and habits. Women who are undergoing the treatment become very hysterical in their efforts to avoid anything that may tend to disturb the calm frame of mind essential to the best results of the treatment."

It is strange that although mercury is recognised as the proper drug for the disease in the secondary stages, it is hardly ever used. In the later stages iodide of potassium (the Arabic "iodoor" يودور) is added to the "aieshbah", and in this way enormous doses of the drug are taken, and very rarely with any untoward effects.

In some of the villages the barbers, who correspond to the old barber surgeons, apply mercurial ointment to the primary chancre, or, rather, indiscriminately to all varieties of sore on the genitals ; and should a sore

PLATE 12.



Fig. 1.—The 'bon jour' drop, not from gonorrhoea but from bilharziosis of the urethra. P.A.





Fig. 2.—Gumma of the skull. P.A.

Fig. 3.—Congenital syphilitic changes in the bones of the legs. P.A.



Fig. 4.—Charcot's knee. P. A.

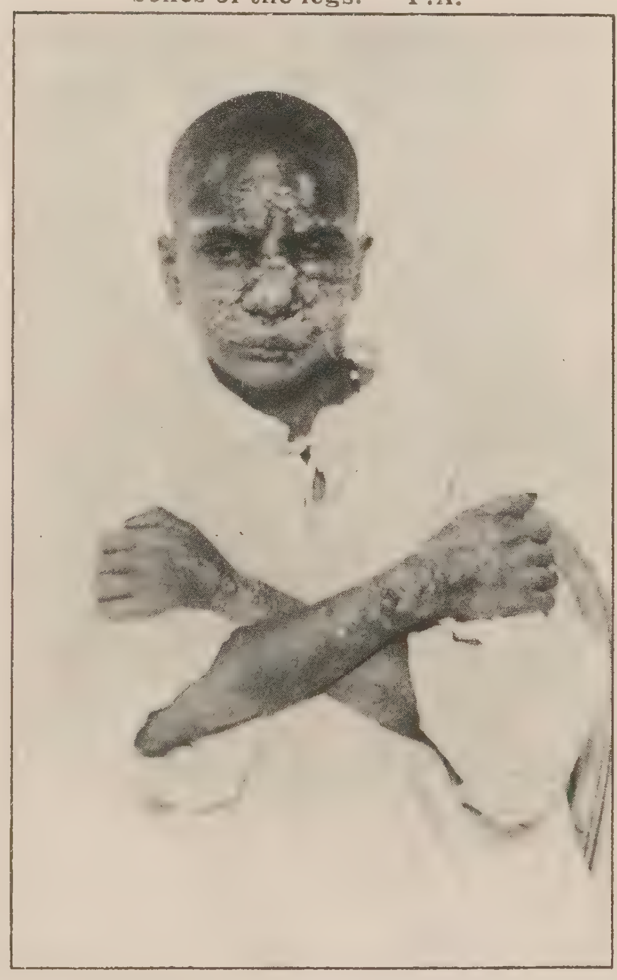


Fig. 5. — Marked iodide of potassium eruption. P.A.

be found on the prepuce, it is commonly held that circumcision will effect a complete cure of the disease, be it syphilitic or not. There cannot, however, be much scope for this operation, as it is the universal custom to circumcise all boys at an early age.

When one has the opportunity to treat a case by MODERN METHODS the process presents no special features, the repeated intravenous injections of salvarsan or galyl being most usually employed, with inunction or injection of mercury whenever possible in the secondary stages, and very large doses of iodide for the tertiary manifestations.

The discoveries, during the last ten years, of the spirochaeta pallida, salvarsan, and the Wassermann reaction, have completely revolutionised our whole conception of syphilis, and we must briefly refer to them all, and to their bearing on the diagnosis and treatment, for the benefit of recent Egyptian students and graduates.

Gibbard and Harrison, in an article on the treatment of syphilis in its early stages in the British Medical Journal of Nov. 22nd 1913, give a very good resume of the whole matter ; and we will take this article as our text and adapt it to our own purposes as may be necessary.

"It is of the very greatest importance to commence treatment in the earliest possible stage" ; therefore in all cases of an even suspected sore, with the faintest suspicion of syphilis, *an examination for spirochaetae should be made at once.*

The directions for finding spirochaetae given by Phillips and Glynn in the British Medical Journal of Nov. 11th 1911 are so clear that we will proceed as they there advise.

"The primary sore is first cleaned with absorbent wool, rubbed with the wool, and then swabbed two or three times with wool soaked in methylated spirit. In a minute or two the spirit is wiped off and soon clear serum begins to exude and is collected in a capillary tube.

The Spirochaetae are now searched for by (1) dark-ground illumination with a Leitz condenser bull's-eye lens and a Nernst lamp; or, (2) by mixing a drop of serum with at least twice the volume of Indian ink on a slide, and spreading it quickly into a smear with another slide, as in making a blood film; or, (3) by spreading a drop of serum on a slide as thinly as possible, its limits being marked by a blue pencil. After drying and fixing in absolute alcohol it is stained face downwards with Giemsa's stain (diluted 1 in 8) for at least twelve hours. This long method is the most reliable staining method, but is not so practical for immediate diagnosis as the other two, of which the dark ground illumination is generally the most reliable."

The characters of the Sp. pallida and its differences in appearance from other spirochaetae can only be learnt by practical experience.

If Sp. pallida are found in the preparation, treatment must be started at once. The case may not come under notice until a much later stage and secondary lesions are already present. If the chancre still exists, and has not been treated by a course of strong antiseptics, Sp. pallida can still be found in it as just described; and, in addition, their

presence in the secondary lesions can be determined by first scraping one of the secondary papules with a knife and then applying methylated spirit. The serum resulting from this little operation is collected and examined as in the case of the primary chancre.

The *Wassermann reaction* is not reliable until three or four weeks after the appearance of the sore; and to test for this reaction, 5-10 c.c. of blood must be withdrawn by a needle from the median-basilic or other vein and drained into a sterilized test-tube and kept for some hours to separate out the serum, before applying the test. We may say that a positive Wassermann is absolutely diagnostic of syphilis; but, there are so many fallacies in the technique of the test, that a negative result does not always mean that the patient is not affected with syphilis.

The great value of this reaction is an indicator of the progress of treatment and, subsequently, as evidence of cure. It must therefore be applied during treatment; and must remain negative for at least a year after all treatment has stopped, before a perfect cure can be pronounced.

Having made the diagnosis as early as possible clinically, and confirmed by the methods above detailed, a *scheme of treatment* must be planned and strictly adhered to. A very good working scheme for soldiers, policemen and hospital patients is to give an intravenous injection of 0.60 of salvarsan, or of kharsivan or galyl, or 0.75 of neo-salvarsan; then five weekly intra-muscular injections of mercurial cream, or salicylate of mercury in oily suspension; then a second intravenous injection of salvarsan (or one of the other preparations) in the same doses as before; followed by five more weekly mercurial injections and finally a third intravenous salvarsan (or one of the other preparations in the same dose as before).

Neo-salvarsan and kharsivan have practically the same results as salvarsan and galyl also acts well, but must be given more frequently, i.e. six injections during the course at fortnightly intervals.

Lambkin's formula for the mercurial cream is metallic mercury 15.0, anhydrous lanoline 60.0, liquid paraffin (with 2% carbolic acid) to 150.0. This contains one grain of mercury in ten minims, which is the maximum dose once a week. The salicylate of mercury is very convenient as it is put up in ampoules containing 0.01 (1/6 grain) in 1 c.c., the dose being from 10 minims to 1 c.c.

This is a general scheme of treatment which must be modified as necessary to suit the individual case and represents a minimum course. The practical application of these principles of treatment cannot be learnt from any book description, it comes only with experience.

The primary sore should be excised, if accessible, or cauterised or treated with calomel or white precipitate ointment. Secondary lesions also require local attention with mercurial ointments, gargles, lotions, or powders.

Two months after the completion of the course indicated above the blood is examined and, if the reaction is negative, it is repeated every

two months for a year after the completion of treatment. This applies to cases put under treatment before the secondary stage had appeared. Cases with secondary lesions when first seen, are examined both clinically and by Wassermann regularly during the second year also.

In either case, should any clinical evidence of relapse or a positive reaction appear at any examination, the whole course of treatment must be repeated and just as thoroughly as the first time.

In *tertiary* cases the Wassermann test is still our indicator and, unless otherwise contra-indicated, the treatment must still be salvarsan and mercury supplemented by iodide of potassium. This is a particularly nauseous drug, besides having often a powerfully depressant and other unpleasant effects. It should therefore be combined with other drugs, among which bicarbonate of potassium and other alkaline carbonates, liquor arsenicalis, sal volatile, and sarsaparilla not only counteract its bad effects, but also increase its action, and to some extent disguise its taste. I find that the most effective formula is iodide of potassium 0.30, liquor arsenicalis 0.20, aromatic spirits of ammonia 1.50, and decoction of sarsaparilla to 30.0; three times a day. The dose of the iodide should be slowly increased.

Further, when for any reason mercury by injection is not feasible, I prefer the pill of grey powder and Dover's powder, 0.065 (1 grain), with a simple excipient, three or four times a day, to any other; and in children, and in tedious cases in adults, inunction with blue ointment often succeeds admirably.

In *private practice* it is almost impossible to carry out such an intensive treatment as we have advised for many reasons. The patient has to attend to his usual work, the treatment has often to be followed in secret, and the necessary frequent visits are very difficult to arrange. My usual plan is to give 0.60 salvarsan intravenously in the late afternoon and keep the patient in bed till the next morning. The salvarsan is very carefully dissolved in about 60 c.c. of freshly distilled and sterilized normal saline solution well warmed, and a sufficient quantity, by drops, of a 15 % solution of sodium hydrate added, first to precipitate and then to just clear the solution. 100 c.c. of warm normal saline solution is now poured into the funnel and 50 c.c. of this fluid introduced into the vein. (The secret of getting the needle easily into the vein is to have the vein thoroughly well distended by placing a tight bandage round the arm, and fixing the vein by pressing it upwards with the left thumb while piercing it with the needle). The salvarsan solution is then poured down the side of the funnel into the N.S.S. and all allowed to run in. While still there is about 30. c.c. of fluid left, a further 50 c.c. of N.S.S. is poured in and the funnel emptied to the last 5 c.c.

With these precautions after proper preparation, as for an operation, beyond a rise of temperature, rigors and perhaps vomiting, no ill effects are usually seen. (The technique and possible dangers of salvarsan must be read in special papers). With kharsivan it is recommended to dissolve it in *doubly* distilled water or N.S.S.

Two days after this injection, if it is possible,. an intramuscular injection of mercury is given and a second salvarsan intravenously eight days later. If the patient cannot attend for injection he is put on grey powder pills three times a day between his two doses of salvarsan.

After these two intravenous injections he is kept on a steady mercurial course, either injections or pills, for three months. A Wassermann is then done, and if negative, mercury is continued for the rest of the year steadily. During the second year he takes mercury for fourteen days each month for the first six months, and for seven days a month during the second six.

Wassermanns are done every three months after the first one has proved negative for four times and, finally, at the end of the second year. If the Wassermann is positive after the first three months treatment, the whole course is repeated ; as is necessary also, *at any time* if clinical symptoms of a relapse appear, or a Wassermann proves definitely positive.

Harrison, White and Mills have recently published in the British Medical Journal of May 5th 1917, their experience of the use of intramuscular injections of neo-salvarsan and compared the results with those of intravenous injections of salvarsan and its substitutes. They have come to the conclusion that the intramuscular neo-salvarsan gives the better result, as checked by the W.R. at some time after treatment. A course of seven injections is given. The formula they have found most suitable is thus described :-

Injection of 0.6 gram neo-salvarsan dissolved in 1 c.cm. of a 4 % solution of stovaine, and made up to 2 c.cm. with creo-camph cream melting at 15° C. *(Burroughs Wellcome & Co's. special formula).

This has proved the most comfortable injection up to the present. In some cases it has been accompanied by a hypodermic injection of morphine, gr. 1/3. This has been sufficient to overcome the dull ache in the site of the injection, which may last for about six hours afterwards.

The solution is effected by dissolving the neo-salvarsan in the syringe, the creo-camph is added, and the mixture well shaken.

The injection is made about a point three-fingers breadth below the crest of the ilium on a line joining the tuber ischii with a point on the crest of the ilium which is perpendicularly above the great trochanter when the patient is upright. The detached needle is driven into the muscle vertically to the skin.

The general reaction which follows an intramuscular injection of neo-salvarsan is much less than after an intravenous, and we have not experienced any cases of vasomotor disturbance,—flushing, constriction of the throat and chest, etc., such as sometimes follow an intravenous injection. The tonic effect is greater when the injection is intramuscular than when the remedy is administered intravenously. It will be remembered that in the early days, when salvarsan was administered intramuscularly, the tonic effect was a pronounced feature in all reports on the subject.

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*Since the above was written we have given a number of injections in which the creo-camph was replaced by campho-phenique, with, so far, encouraging results.

Their conclusions are :—

"1. The intramuscular or subcutaneous injection of neo-salvarsan, novarsenobenzol, or novarsenobillon is superior in immediate therapeutic effect to that of the intravenous injection of salvarsan, kharsivan, arsenobenzol, or arsenobillon.

2. Spirochaetes disappear from syphilitic lesions just as rapidly after the first intramuscular as after the first intravenous injection, and the Wassermann reaction is more quickly influenced.

3. Solution of the dose of neo-salvarsan in 1 c.cm. 4 % stovaine and emulsion in creo-camph cream (1) eliminates discomfort sufficiently to make the intramuscular injection of neo-salvarsan practicable for routine use."

In *tertiary* syphilis, iodide of potassium is given with mercury after the salvarsan injection, my usual custom being to give the pills before and the iodide after meals.

The principles we have tried to emphasize throughout are, to make as early a diagnosis as possible, start and maintain a vigorous and thorough treatment, and check your results and success, in all stages of the disease, by repeated blood examinations.

In concluding this description of venereal diseases, I am appending a paper with some very excellent practical notes on the taking of specimens for examination and the diagnosis of the various diseases they are responsible for. These papers were published in the Lancet of December 2nd and December 9th 1916, and give much valuable information on this subject.

SOME PRACTICAL POINTS IN THE TAKING OF SPECIMENS FOR DIAGNOSIS IN VENEREAL DISEASES

These brief notes have been written by Mr. Claude H. Mills, Assistant Surgeon to St. Paul's Hospital for Skin and Genito-urinary Diseases, Medical Officer in charge of the syphilis wards at Rochester Row Military Hospital 1914-1916. Their object is to help those who have not hitherto had a wide experience in this specialty to arrive at an early rapid and accurate diagnosis.

URETHRITIS

1. PROFUSE DISCHARGE. Thoroughly cleanse the glans penis, especially the meatus, with alcohol or methylated spirit, and wipe away the first bead of discharge that exudes and collect the second at the end of a clean slide, and draw out as in the preparation of a blood film. Be careful not to make the film too thick, and not to overheat in fixing. If a specimen is required for culture, it is better to take same with a wire loop from the fossa navicularis — the lips of the meatus being kept separated the while—and transfer immediately to blood agar medium. In cases complicated by phimosis, it is advisable first to administer a prolonged subpreputial irrigation of sterile water to remove the accumulations resulting from balanitis which is always present in varying degree. Dab preputial orifice with filter paper till dry, and express discharge by firmly drawing a finger along under the floor of the urethra, from the bulb forwards, and collect same at preputial orifice.

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(1) Note :—Creo-camph contains creosote and camphoric acid, of each 10 %.

2. SCANTY DISCHARGE. When pus is unobtainable by above method a satisfactory specimen can easily be procured by using an Eyre's modification of Kelly's urethral speculum, having previously washed out the anterior inch of the compressed urethra with sterile water. This is especially valuable in procuring material for culture.

3. URETHRITIS WITH NO APPRECIABLE DISCHARGE AT THE MEATUS, BUT WITH EVIDENCE OF SAME IN URINE. After cleansing the glans and meatus the patient should pass the morning urine direct into a sterile flask or wide-necked bottle, without making contact with same. Giving a quarter of an hour to settle, remove sediment with pipette and transfer to centrifuge tube and thence to slide. If a centrifuge is not at hand, allow urine to stand for rather longer and transfer sediment direct to slide, remove excess of urine and slowly evaporate. Any large strands of mucopus can be extracted from the urine with platinum loop and placed on slide for staining. The centrifuge is an advantage since time is saved and a cultural growth therefrom more readily obtainable. It should always be borne in mind that the longer gonococci remain in a stagnant urine, the more they tend to lose those characteristics by which we are able to differentiate them.

4. VAGINAL DISCHARGE. After a prolonged douche of boric lotion has been administered, the specimen should be taken from pus produced by drawing a finger along the floor of the urethra. In the absence of a hymen, a speculum should now be passed and a second specimen taken from the cervix uteri. It is practically useless to take a specimen from the discharge at the vulva, such is the variety of organisms present.

TO OBTAIN SERUM FROM A CHANCRE. Points to be borne in mind. (a) S. pallida are most abundant in the margin and in the deeper layers of the base of the sore. (b) S. refringens, S. gracilis, S. balanitidis will only be found in the exudate and superficial layers. (c) The ideal specimen should contain a minimum of blood cells.

PROCEDURE. To clean the surface of sore, first apply a hot compress of normal saline; this will remove the scab of dried exudate if present. It will lessen haemorrhage, and will in no way tend to devitalise the S. pallida. A *moist sore*, surmounted with a film of necrotic debris, is first cleansed by gently dabbing with absolute alcohol and then applying compress. The chancre should now be gently squeezed between the thumb and index finger of the gloved left hand ; a rolling movement often helps. After the pressure is relaxed the serum will be seen to exude. Scraping the chancre will only be resorted to should this fail, since it usually produces haemorrhage. If for immediate examination, the serum should be placed on cover-slip either by direct contact or with a wire loop and mounted for dark-ground examination. If it is to be sent to the laboratory – possibly some distance—then the serum should be collected in a finely-drawn capillary tube, shaken to the centre, and the ends sealed in the flame of a Bunsen or spirit lamp, care being taken not to heat the serum. Capillary tubes are easily prepared by drawing out 3/8 in. glass tubing at dull-red heat over a Bunsen or better with the bellows and flame for glass-blowing.

Lieutenant Colonel L. W. Harrison R.A.M.C., was the first to advocate the use of capillary tubes for this purpose. S. pallida will exhibit vigorous movements when put up in this manner for three days at least, and longer if the tube be kept in the dark at body temperature. I have not observed movements in S. pallida beyond eight days, but have seen S. refringens and S. gracilis quite active under dark-ground illumination up to the thirtieth day. The serum is easily driven out for examination on to a cover-slip by breaking one end of the capillary tube and heating from the other.

TO OBTAIN SPECIMEN BY GLAND PUNCTURE. Select a painlessly and discretely enlarged gland of "india-rubber" consistency, not one exhibiting the slightest tendency towards suppuration from mixed infection. I have never yet succeeded in detecting S. pallida in a gland showing this tendency in a syphilitic by puncture.

PROCEDURE. Having shaved the region and painted the skin with iodine, insert exploring needle through same and transfix the gland. This can be verified by moving the gland with the needle when it is fairly impaled. One should aim at placing the point of the needle well into the centre of the gland. Affix glass syringe and now inject 5-10 minims of normal saline, gently knead the gland for about a minute, and then slowly aspirate. The object of the saline solution is to clear the needle, and create a cavity, as it were, in which the point rests. Without the previous injection of fluid the needle becomes occluded by gland substance immediately negative pressure is applied. I have obtained far more gratifying results since I first devised this simple procedure. Release the suction before withdrawing the point of needle from the gland. This method provides sufficient fluid for several slides for dark-ground or other examination, or for putting up in capillary tubes.

TO OBTAIN SPECIMEN FROM SECONDARY SYPHILIDES OF THE SKIN. Gently remove the epidermis over a macule or papule or the crust from a papulo-pustule with a spud, avoiding haemorrhage. Compress with hot saline and apply vacuum with suitable sized Bier's cup (heated test-tube or soda-water bottle answers equally well) to lesion for five minutes. Gentle squeezing after removing the cup will give sufficient serum for examination. With an erythematous or roseolar rash blistering with liq. epispasticus overnight (the area should be covered with a pill-box to protect blister when formed) will provide ample clear serum for diagnostic purposes.

IN TAKING SPECIMENS FROM LESIONS IN THE MOUTH AND PHARYNX. Here it is a wise precaution to wear goggles. Specimens taken should always be examined immediately where possible, since S. MICRODENTIUM which is so commonly present, is much more easily distinguished from S. pallida whilst alive and exhibiting vigorous movements. If circumstances necessitate the sending of a specimen to a laboratory, a warning should be given to the bacteriologist as to its source. It is always more advisable to send a fluid specimen in a capillary tube than a dry film, because even when the spirochaetes are dead it is possible for a microscopist, experienced in this work, to give an opinion with the dark-ground illumination. In a dry preparation it is practically impossible to distinguish between S. microdentium and S. pallida by staining methods, especially with the ground stains (Burri's, Harrison's, Congo red, etc.)

TAKING SPECIMENS FROM THE FEMALE: LABIAL, GLOSSAL AND FAUCIAL LESIONS. These can usually be thoroughly cleaned up, thereby rendering the presence of the microdentium—a surface contamination—less probable. Faucial lesions should receive a preliminary cleansing by prolonged gargling with plain hot water. The specimen is obtained by gentle scraping with a blunt triangular spud. This always requires dilution with normal saline before immediate examination or transference to a capillary tube.

TAKING BLOOD FOR WASSERMANN TEST. A very convenient method is that employed in the Guy's Hospital Laboratory—viz, of receiving the blood into a test-tube fitted with a cork drilled with two holes. Into the one is fitted a 2 inch length of glass tubing, to which the needle for venipuncture is attached by a 6 inch length of rubber tubing. The other hole is merely to allow for the escape of air whilst the blood is flowing into the test-tube when the vein is punctured. This simple device obviates the spilling of even a drop of blood. It is easily sterlized. The sterile test-tube

or other receptacle should always be moist within (steamed): this prevents clot clinging to sides, which frequently happens if tube is dry-sterlized. Send the *serum* only if specimen has to travel through the post in sealed ampoule. I would always advocate taking the blood by venipuncture, because, (1) It provides practice in the puncturing of a vein, (2) Ample serum is thus provided for one or more modifications of the test, or should an accident happen during the performance of same.

LUMBAR PUNCTURE. With few exceptions this can always be performed with little or no discomfort to the patient under local anaesthesia. First infiltrate an area of skin to the size of a shilling exactly over the interspace selected. Now inject into the subcutaneous tissues, and lastly into the supraspinous and interspinous ligament; 5 c.c. of solution will accomplish this. In making the puncture special care should be taken after perforating the ligamentum subflavum not to drive the point of the needle right across the canal, thereby impinging nerve fibres up against the anterior wall. Allow at least 2 c.c. of cerebro-spinal fluid to escape before collecting that required for examination, which should be as free from contamination with blood as possible. It is a good plan, therefore, to receive the fluid into a first and second test-tube, labelling them (a) and (b). The cytological examination and globulin estimation should be done at once; the Wassermann test can wait, of course.

DIAGNOSIS: (a) FOR DETECTION OF GONOCOCCI.

(1) In the case of a smear preparation obtained from an early case of urethritis when a mixed infection is improbable—i.e. during the first week or ten days—staining with Kuhne's methylene-blue for two to three minutes provides a rapid and accurate diagnosis, the formula being: Methylene-blue 1.5 gm., abs. alcohol 10 c.c.; dissolve for 24 hours and add 5% ac. carbolici 100 c.c.

Precautions. Do not overheat the slide in fixing. Always apply the stain through filter-paper. With this method a positive diagnosis is only justifiable when the specimen exhibits very numerous intracellular diplococci with their adjacent borders concave.

(2) In specimens obtained from a urethritis at a later date, when the infection is likely to be mixed, and always in examining urinary deposits, a differential stain is essential, and for this Grams' method, with its several modifications, is indispensable.

Precautions. As above. Avoid delay in examining a specimen of urine which should always be freshly passed. Gonococci become swollen and rounded if allowed to remain too long in the urine, closely resembling staphylococci, which latter tend to become Gram-negative under these circumstances.

(3) The most reliable method of all is that of isolation by culture, the most suitable medium for gonococci being blood-agar (or Gurd's and Wertheim's serum media). In all cases possessing the possibility of litigation, corroboration of the diagnosis by culture should never be omitted.

Precautions. (a) Special care should be taken to obtain the specimen as free from contamination as possible, by the methods previously described. (b) Transfer specimen direct to warm medium (37°C.) and replace same in incubator, permitting a minimum of cooling down.

(b) METHODS FOR THE DETECTION OF THE S. PALLIDA.

(1) GROUND STAINS. In this method the material for the examination is well mixed with an equal quantity of the stain (one minim of each) at one end of the slide, and then drawn out as a film. The colourless spirochaetes are distinguished standing out in a stained background.

BURRI'S INDIAN-INK METHOD. The ink that I have found most satisfactory for this work is the Chin-Chin brand (Gunther and Wagner) and at the time I was relying chiefly upon this method,(2) I found that the addition of tr. iodine m. xv. to the ½ oz. gave a better film with cleaner definition.

Technique. The clean slide upon which the film is drawn should be free from scratches and be polished with silk. The edge of the slide used for the "drawing" should have irregularities previously removed by gently grinding upon an oil-stone. Do not make the film too thick; removal of excess of fluid with filter-paper before "drawing out" will prevent this. Specimens should include a minimum number of blood cells.

HARRISON'S COLLARGOL METHOD. As above, using 5 °/₀ collargol in place of the Indian ink. This gives a less granular background, but of a lighter colour (red-brown).

CONGO-RED METHOD. As above, using 2 °/₀ Benian's Congo-red. The dry film is then washed with 1 °/₀ solution of HCl in absolute alcohol. The background is a homogeneous light blue. Spirochaetes stand out faintly by contrast, but when visible their shape is well-defined.

Precautions. If the specimen is taken from the mouth, remember that S. pallida is indistinguishable from S. microdentium by these methods; if from the glans penis or inner surface of the prepuce, S. gracilis is usually present. Some of the fine varieties of this spirochaete are very apt to be misleading. When dead one cannot easily distinguish that they are apparently ribbon-shaped in transverse section as opposed to the roundbodied pallida. The size, both of the spirochaete and its spirals, must always be gauged by comparison with a red-blood cell, preferably in the same field.

(2) SPIROCHAETE STAINS. Giemsa's and Leishman's stains are those most commonly used for staining film preparations of spirochaetes. It is well to remember that S. pallida stains more faintly than the other varieties of spirochaetes. For demonstrating the flagella Loeffler's stain is usually employed.

(3) If a *piece of tissue* (preputial chancre, excised gland, etc.) is received for examination in 10 °/₀ formalin solution it should be cut first into slices one-eighth of an inch in thickness and then stained by Levaditi's method. The S. pallidae stand out very clearly in the subsequent sections, being stained a deep black. To obtain the best results it is better to allow the specimen to soak in the 1.5 °/₀ silver-nitrate solution for at least a week rather than the three days usually recommended. Levaditi's pyridin method is much quicker as the whole process can be completed within 24 hours, but the spirochaetes do not show up so clearly.

In all of the above methods—ground stains, spirochaete stains, stained sections—we are examining the spirochaetes when dead, and are therefore deprived of the most distinctive characteristic for differentiation, i.e. their movements. None of these methods is to be compared with the dark-ground illumination for simplicity, speed and accuracy.

(4) TO EXAMINE BY THE DARK-GROUND ILLUMINATION. Transfer the fluid obtained from chancre, gland puncture, mucous patch, cutaneous syphilide or suspected lesion in the mouth or pharynx, either direct with platinum loop or from capillary tube on to a clean cover-slip (No. 1 thickness) held in Cornet's forceps. If the specimen unavoidably contains much debris or blood it should be diluted with a drop of normal saline

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(2) Guy's Hospital Gazette, December 1911: "A Report upon the use of Salvarsan in 50 cases of Active Syphilis Treated as Out-patients."

solution and diffused over cover-slip. This should now be gently lowered with the moist surface downwards on to the centre of a clean slide. It is a good plan to regulate the process with a metal spud, gradually withdrawing the same from beneath one edge of the cover-slip whilst the opposite edge rests upon slide. If the slide is first moistened by passage through steam a more even contact is ensured and air-bubbles are avoided. The excess of fluid should now be expressed by applying firm pressure with a piece of filter-paper placed over the cover-slip. The object of this is to obtain as thin a layer of fluid for examination as possible, thereby insuring the best definition under dark-ground illumination. If a greater depth of fluid is permitted currents will develop in same when the slide becomes warm—usually at different levels—rendering focussing difficult, and the spirochaetes have ample depth to dive in or out of focus. Even in a shallow preparation these currents will be troublesome should the cover-slip overlap the edge of the slide, or again should any large air spaces be present, which, of course, expand when temperature becomes raised. In using a dark-ground condenser of short focal length (this should be ascertained) slides should only be used the thickness of which comes within this margin. The Swift condenser is very useful for this work, having a focal length which will permit of the use of almost any ordinary slide, and by using a thin slide there is ample play for very delicate adjustment. The condenser should always be accurately centred. With the model just mentioned this is a very simple procedure. The condenser is first raised flush with the movable stage, and with the two-thirds objective the two circles cut on the face of the condenser are focussed. By means of the two screws for this purpose the circles are centred. The condenser is now lowered and a drop of oil placed upon its upper surface. Oil is also placed on top of the cover-slip and corresponding under-surface of the slide, which is now placed upon the movable stage. The condenser is raised until its oiled surface makes contact with that of the slide; air-bubbles are thus avoided. The 1/12 inch objective is now gently lowered on to the oiled cover-slip and focussed and the reflector is further adjusted. The condenser should now be raised or lowered, as the case may be, until the maximum dark-ground effect is attained.

Regarding illumination I have nothing to add to the description furnished with the apparatus depicted in the Lancet of Oct. 21st for this purpose. The commonest mistake made by the beginner is to focus the upper surface of the slide, not the moving particles in the fluid specimen. It is a wise plan first to focus a red blood corpuscle, and then perfect the adjustment of reflector and dark-ground condenser.

In searching a field one must be constantly altering the fine adjustment, since it is very easy to miss a S. pallida, though present, if it is not in the focal plane. I always make it a rule never to diagnose the case on the finding of but one S. pallida. If there is one, there are bound to be more, and the finding of half a dozen typical pallidae always eliminates the personal equation or error. In examining a specimen from a lesion of the fauces or buccal cavity this rule should never be broken, with this exception that one is at times fortunate enough to obtain a S. pallida and a S. microdentium in the same field, and then the diagnosis by comparison is at once easy and devoid of error.

(c) DIFFERENTIAL DIAGNOSIS IN SPIROCHAETES.

With regard to differential diagnosis in the spirochaetes met with in examining specimens in venereal diseases by dark-ground illumination, the following points should be observed :—

Size. The standard for comparison for length should be the diameter of a red blood corpuscle (*7.5u*) which can always be included in a specimen, red cells being, in fact, rarely absent.

Shape. Does the spirochaete terminate abruptly at each end or does it fade away so that one cannot actually distinguish its termination? If the latter, one is often able to detect the existence of a flagellum by observing particles adherent to same, a blank space intervening. I have observed two S. pallidae which have become entangled, still held together at the one pole by their flagella after their bodies were free. Is the *body* of the spirochaete uniform in width throughout? Does it appear to be flattened, ribbon-shaped, or is it round in transverse section? Note the irregularity of the spirals—i.e. would each third of the total length contain an equal number of spirals? Are the spirals "steep", rendering it difficult to focus the whole of the body, thereby producing the "string of beads" effect?

Movements. Be certain that the movements are intrinsic and not merely produced by currents in the surrounding fluid. Are these continuous or intermittent, the spirochaete lying as though dead for some seconds suddenly resuming vigorous movement? Note the flexibility, also rate of progression. Is there a definite cork-screw movement of rotation, always in the one direction, or can the spirochaete reverse same? Do not confuse this movement with a wriggling movement in one plane analogous to that of a snake through the grass. This latter S. microdentium frequently exhibits, but S. pallida never. Notice any special configuration, such as the formation of a loop at one end, or of a complete circle. A movement to be noticed is a curious diving out of focus, as though the spirochaete were "standing on its head".

Refractivity. Note if the rays are refracted in a pure white light, or whether they are broken up on the surface of the spirochaete, giving same a yellow tinge.

1. S. BALANITIDIS. This spirochaete is always present apart from any inflammatory process beneath a moist prepuce.

Size. A small spirochaete rarely exceeding 5*u* in length (less than the diameter of a red blood corpuscle). It is, however, coarse in comparison to S. pallida, being nearly as broad as S. refringens.

Shape. Usually possesses but two complete shallow curves, often one and a half. Its ends are blunt, having no flagella. One end usually thicker than the other. True focussing will reveal that it is apparently ribbon-shaped. In some lights it appears to have an undulating membrane.

Movements. Very rapid in fresh specimen—almost dazzling; capable of rapid progression, which is chiefly produced by a wriggling along in one plane (snake-like).

Refractivity. Very bright, but yellow tinge in faulty focus.

(2) S. GRACILIS. This spirochaete is normally present beneath a moist prepuce. I have, however, found it in venereal sores on or about a dry glans penis. I have never detected it in specimens from gland punctures. This fact is important since gracilis is the spirochaete that most resembles S. pallida in a genital chancre. It is usually removed from a lesion by careful cleansing, its habitat being in the superficial debris, but not in the deeper layers. It a is hardy spirochaete, since I have seen it exhibit active movements after 30 days' confinement in a sealed capillary tube.

Size. Length usually 6 to 8*u*. and fairly constant. Breadth 0.5*u*. (half that of S. refringens, twice that of S. pallida).

Shape. It is a blunt-ended spirochaete, possessing regular curves, which are more rounded and not so steep as those of S. pallida. The terminal spirals are usually somewhat turned in on themselves. By slightly varying the focus one can quickly distinguish that it appears to be ribbon-shaped, exhibiting a broad surface alternating with a thin edge.

Refractivity. When imperfectly focussed it will assume a yellow tint.

Movements. Progression good compared with S. pallida, sometimes moving backwards and forwards in a straight line, pausing at the turn. Exhibits the "corkscrew" and also "concertina" movements. Is not so flexible as S. pallida.

(3) S. REFRINGENS. This spirochaete, as its name implies, refracts the light in a dazzling manner. A coarse, blunt-ended spirochaete; with its few shallow irregular spirals, it suggests a resemblance to a miniature threadworm rather than a delicate spirochaete. It is present in many ulcerative or dirty papillomatous conditions, and is so readily distinguished that a detailed description here is unnecessary.

(4) S. PALLIDA. *Size.* The variations in length are considerable, varying from 5 to 25*u.*, but as far as one is able to judge, the width seems to be constant, being placed at 0.25*u*. There is always a fairly wide range in the length of the individual S. pallida obtained from a common source, but one frequently observes that in the one case there may be a preponderance of very long spirochaetes, whilst from another the majority will be of the short variety. It is the most slender spirochaete met with outside the buccal cavity and the only type possessing flagella (excluding S. pertenuis of yaws—happily foreign to this country).

Shape. The spirals are extremely regular and closely set, rendering the individual curves steep for their breadth. It is this depth of the curves that produces the "chain-of-beads" effect under the dark-ground illumination when the apex of each curve is focussed. How one can determine the presence of the flagella has been already described. Its body is not flattened from side to side.

Refractivity. S. pallida, compared with the above spirochaetes, is very feebly refractile, and the rays deflected are of a purer white than those of any of the others—a cold non-dazzling white, devoid of a halo illumination extending to the surrounding medium.

Movements. Progression very feeble, and provided there are no currents a S. pallida will remain within the field for hours. Its most vigorous movement is rotation upon its long axis (corkscrew). It is extraordinarily flexile, throwing itself into acute angular bends, hinge-like, always returning to the almost rigid straight. It may exhibit slight contraction and expansion in length. Waves pass from time to time from one extremity to the other. Often it will show a loop either at an extremity or towards the centre, persisting for some time. Another configuration is a complete circle, the two flagella becoming entwined. A characteristic movement is an abrupt dive out of focus—even in the shallowest of specimens—analogous to that of a porpoise. Whilst perpendicular one can detect its presence by the disturbance of the surrounding particles. It seems incapable of freeing itself at all quickly after a collision.

(5) S. MICRODENTIUM. This is the spirochaete common in dental caries and pockets and is frequently present in the exudate or slough from an ulcerative lesion in the mouth or fauces. Its importance in this work is solely due to its resemblance to S. pallida.

Features. The length of this spirochaete rarely exceeds 6*u*. Its width is similar to S. pallida and its shape is identical, excepting that flagella cannot be detected. The refracted rays are not of such a pure white. Regarding movement, its progression is vigorous compared with S. pallida, which it attains chiefly by a gliding movement similar to a snake, not rotary. It is not so flexile, nor can it throw such angular bends as the above, and it does not resume its straight position as persistently.

(d) CEREBRO-SPINAL FLUID.

The cell count and globulin estimation should always be done immediately. For the former Fuchs and Rosenthal's counting chamber is recommended by Harrison. For the latter Nonne-Apelt saturated ammonium sulphate test is rapid and simple. The Wassermann reaction can be done at leisure.

(e) WASSERMANN TEST.

It would be outside the object of these practical notes to discuss the technique of the Wassermann test with its many modifications.

It may be of interest to mention a method of treatment which one of my patients devised for himself and which proved very efficacious. He was suffering from old tertiary ulcerations of the lips, mouth and nose; and after a long course of iodide without avail, discovered that mercury was the only drug of the least service to him. Hoping to obtain the local as well as the constitutional effects of this drug, I advised him to try the inhalation of sublimed calomel through a cardboard tube, drawing the smoke into his mouth and exhaling it through his nose, a practice easy of accomplishment to such an inveterate smoker as he was. The apparatus not proving satisfactory, he made some small cakes, each containing about a drachm of calomel mixed with tobacco-dust and honey. He then placed one of these cakes on the live coals of a narghileh or hubble-bubble pipe, and so smoked the sublimed calomel with excellent results. He found that two pipes a day for three days mercuralised him and at once brought about an improvement in the local condition. Properly watched and carefully regulated, this method is worthy of a trial in similar cases.

There appears to be practically no limit to the amount of iodide of potassium the native Egyptian can take without poisonous effects. I can only remember to have seen two cases of iodism among a very large number of out-patients. The combination of iodide and mercury—the biniodide—very rarely proves of service, though I fear it is very often given on the "shot-gun" principle of curing either the secondary or tertiary manifestations without taking the trouble to make a careful diagnosis of the case.

PROPHYLAXIS OF SYPHILIS.

The only attempt made by legislation in Egypt to prevent the dissemination of syphilis is the compulsory examination and treatment of the public women in the large towns, and, as far as possible, generally throughout the country. These women must report themselves to the police doctor once a week for examination; and should any sign of venereal disease be found in them, they are sent to a special hospital and there treated for as long as necessary. Primary chancres are very rarely seen, the most common lesions being late secondary manifestations about the mouth and throat, which are very difficult to cure owing to the alcoholic tendencies of these women and the fiery spirits they imbibe. Syphilitic palmar psoriasis, scaly patches on the limbs and trunk, and leucoplakia are particularly common also. After treatment, certificates are given, which are, however, not much safeguard, as a healthy woman increases her income to a considerable extent by letting out her certificate to her less fortunate sisters.

As is only to be expected, congenital syphilis is very common, and is responsible for a very large infant mortality. A great many cases are seen in young infants; but it is rare to find any but late tertiary symptoms in older children. The tiny baby of a few weeks old who comes to the out-patients is often a very typical example of the extreme degrees of pemphigus or intertrigo. Others a month or two older, with small ulcers and sores at the angles of the mouth, within the mouth-cavity, and scattered irregularly all over the skin-surface, snuffling badly, and looking such wizened scraps of humanity, almost monkey-like with their thick covering of fine downy hair and their raw-ham bottom, are only too frequent attendants. After a time they disappear and it is only rarely that they live to any age. Syphilitic psuedo-paralysis is not common. The survivors of these early symptoms, or those in whom the disease has not manifested itself severely until a later stage of their existence, furnish samples of very severe condylomata and mucous patches, the latter being sometimes so extensive as to merit the name of "syphilitic thrush" which I have sometimes applied to them. The only other common manifestation is the extensive tertiary destruction of the nose, face and palate, a condition unfortunately much too often seen, and formerly never treated by iodide, as it was considered to be lupus vulgaris. The extent of the destructive process and the involvement of all the bones to which it spreads at once distinguish it from lupus.

Dr. Fischer, Ophthalmic Surgeon to Kasr-el-Ainy Hospital, finds that eye-disease as a result of syphilis is quite rare in Egypt. There is almost no interstitial keratitis or gummatous iritis, and only a small proportion of cases of choroiditis and other internal eye-changes. This quite accords with my own experience in syphilis generally. Similarly, the true syphilitic teeth are very seldom seen: I only remember to have seen two instances of this condition. Gummata of bones or, indeed, of any other structure, are seldom seen, and syphilitic disease of joints is hardly ever met with. The well-known changes in the long bones in congenital syphilis occur in a far smaller proportion of cases than in England and gummata on the sternum and clavicle are very rare, but, strangely enough, tubercular caries of the sternum is quite common.

The awful ravages of tertiary congenital syphilis on the face, nose, mouth and palate are only too common, and many a poor child presents herself—it appears to be commoner in girls—with a large gaping cavern due to syphilitic excavation of almost the whole face from the eyes to the teeth; the nose, except for the upper portion of the nasal bones, is missing; the nasal fossae are laid open; almost the whole upper lip is gone, and the hard palate and portion of the soft also; silent but convincing evidence of the shocking neglect of the child by her parents. In more favourable cases the skin of the face is intact, but the bridge of the nose is depressed, and there is a hole in the hard and soft palate, and often the pharynx is deeply ulcerated. The disease itself, or the inflammation which accompanies it, sometimes extends down into the larynx, and produces great difficulty of breathing, with gradual asphyxia. Tracheotomy is the only resource, and with the opportunity thus afforded for energetic general and local treatment, great improvement soon follows, and very shortly

the tube can be discarded. There is not the same destruction of cartilages and other essential parts of the larynx in congenital syphilis as has been already described in the acquired variety of the disease.

Just as with the acquired form, post-mortem evidence shows that visceral changes due to congenital syphilis are rare; but I can recall a particularly interesting case of multiple gummata of the dura mater in a child who had all the appearances of chronic mastoid necrosis, this being also due to gummatous destruction in this situation.

In the *treatment* of congenital syphilis one is confronted with a difficulty at once. It is considered wrong to allow water to touch the skin of a child during its first year of life, should there be any trace of suspicion of congenital syphilis. This rule is most strictly adhered to by common people. If, however, opportunity offers, probably the most efficacious treatment is "606" or galyl in appropriate doses, and inunction with a diluted blue ointment, along with the internal administration of Cod-liver oil. Maltine may take the place of the oil, if necessary for any reason. At a later stage grey powder, combined with very small doses of Dover's powder, is much the most effective adjuvant to "606" or galyl; and when the tertiary manifestations are clearly developed, iodide of potassium must be pushed to the utmost limit of safety.

TUBERCULOSIS

Tuberculosis has of late years become so disseminated throughout Egypt that it must now be considered one of its modern plagues; and, unfortunately, the overcrowding and hopelessly insanitary condition of the home-life of the poorer people make its prevention and cure an exceedingly difficult problem. In a report on "Hospital work in Egypt", in the Lancet of Jan. 23rd. 1909, Day records the fact that in Kasr-el-Ainy surgical tuberculosis accounts for more than one-sixth of the total admissions for surgical diseases. Of late years this average has been well maintained though it must be remembered that. with the increased pressure on our accommodation, many cases of hopeless tuberculosis have to be refused admission. In 1912, for instance, 129 cases of surgical tuberculosis were admitted, the proportion of total admissions for surgical diseases being one to nine.

Tuberculosis is peculiarly selective in Egypt and remains confined to glands throughout, or bone, or joint, and does not often affect lungs or other internal organs at the same time, however much generalisation of the disease there may be. It is quite uncommon to find our surgical tuberculosis cases complicated with phthisis, peritonitis or meningitis. An exception to this statement must be made when dealing with the Soudanese, who are very prone indeed to tubercle, and have it very badly. Any power of resistance they may possess, and it is never very much, breaks down very quickly and once tubercle has found a lodgment, it is practically never eradicated.

The *age incidence* of surgical tuberculosis is distinctly higher in Egypt than elsewhere. Epiphysitis at an early age is quite uncommon, as are also subcutaneous tuberculous nodules in young children.

The same *general predisposing causes* are at work here as in England, but the causes of *local irritation,* upon which tubercle may be grafted, differ considerably. Thus there is a comparative absence of the common English causes of glandular enlargements, such as carious teeth, acute throat affections, enlarged tonsils and adenoids and middle ear disease. The outstanding irritant is that due to vermin and parasitic diseases of the skin and especially of the head. Herbert Milton, in describing his experience on one thousand cases of tuberculous glands in Kasr-el-Ainy, calls attention to the almost constant presence of vermin or favus on the heads of young children, particularly girls, and their association with tuberculous glands. With the shaven heads of growing boys and men, the number of glands is far fewer, in fact, of recent years, about half that of girls. In 1908 out of 267 cases of admissions for surgical tuberculosis 109 were tuberculous glands, and in 1912 there were 77 out of 189.

It is really extraordinary that there is not even more wide-spread distribution of tuberculosis throughout Egypt, when one sees the *possibilities of dissemination* one bad tuberculous patient has in his own family and among his neighbours, living as he is in the midst of multitudes of people, cooped up like animals in overcrowded and totally insanitary houses. I have known four persons in the same family die of tubercle of the lungs or its complications within a year, and there appeared to be clear evidence of infection one to the other.

Cold, too, plays its part; and, in this respect, it must be again noted that, while tuberculosis is common generally throughout Egypt, it is very striking how often the Soudanese, who are quite unused to such cold as they experience in Egypt, are the subjects of tuberculosis, and especially tuberculous bone disease, and how extraordinarily difficult they are to treat. Once tubercle has lodged in a Soudanese bone it is only too often quite impossible to remove the disease by anything short of amputation at a joint or through a long bone, or by the complete removal of a short bone. The power of resistance to the invasion by tubercle appears to diminish as the colour of the skin becomes darker, until in the young growing and immature Soudanese it is almost a negligible quantity. Apart from the unaccustomed cold, this frailty of the Soudanese, and their feeble resisting power against tubercle, is only another example of the well-known characteristic of certain specific diseases, more particularly tubercle and syphilis, to flourish exeedingly on the virgin soil of the tissues of primitive uncivilised races.

It will be well now to consider some Egyptian features of surgical tuberculosis in certain special tissues and organs.

TUBERCULOSIS OF THE SKIN AND SUBCUTANEOUS TISSUES. LUPUS VULGARIS is common in Egypt but less so than is generally supposed. I am sure that many cases of so-called lupus are really manifestations of tertiary syphilis, either of the acquired or, more often, of the congenital type. Some of these cases exhibit extensive destruction of the nasal and superior maxilkary bones, a condition which is never seen even in the worst cases of lupus.

TUBERCULOUS ULCERATION OF SKIN, apart from that due to underlying glandular or bony affection, is rare, and is only very occasionally seen as a *senile* tuberculosis of the skin in later life.

It is a constant source of regret that a properly equipped and officered clinique for the X-ray treatment of lupus and other treatable skin conditions is yet to be established in Egypt; in the absence of such installation lupus has to be treated by vigorous scraping and cautery as in pre-Rontgen and pre-Finsen days. In this country, unfortunately, the financing of irrigation schemes and other "works of public utility" always take precedence over any proposed expenditure directed towards the improvement of public health.

TUBERCULOSIS OF LYMPHATIC GLANDS. The *cervical glands* are the most commonly affected and in hospital cases are responsible for nearly one-half of the total admissions for surgical tuberculosis. Even this does not give a true idea of their frequency as we are unable to admit more than a small proportion of the many cases on our waiting list. Throughout Egypt the essential irritant is pediculi, and this universal 'peculiarity,' and the other parasitic infections with which the head is infested, explain the extraordinary localisation of tubercle to the cervical glands. The group usually first affected is that along the posterior border of the sterno-mastoid. From this point the infection extends downwards into the posterior triangle and then forwards under the sterno-mastoid muscle into the anterior triangle to the glands along the carotid sheath and upwards into the sub-maxillary region. Often every gland in the neck seems to be affected, even the small lymphatic glands overlying the salivary glands. At first the glands are firm and separate, but very soon they adhere together and form masses and tend rapidly to caseate and soften. The superficial glands soon become adherent to the skin. The skin soon becomes infiltrated, softens, and finally bursts, and the caseated contents of the glands is discharged. The ultimate result is a tuberculous sinus, with unhealthy prominent granulations on the surface and along its track, which lead to a mass of caseous material in the depths. Perforations may take place over a large area and the skin become riddled with sinuses.

In other cases a more chronic fibrous change occurs and large masses of glands, firmly matted together with fascia and muscle, are found. Not infrequently a complete collar of enlarged glands in various states of caseation and matting is formed. This whole mass tends eventually to caseate, soften and burst externally, and multiple sinuses form, all discharging a thin clear fluid with some pus and, at times, masses of caseous debris.

Not only are tuberculous cervical glands very common in Egypt, but caseation is the rule, and at many operations every gland excised is the seat of this change to a varying extent.

As is only to be expected, sometimes there is a mass of much enlarged glands on the surface, and a multitude of very small enlarged glands, extending along the whole length of the neck, adherent to the large vessels and even extending out behind the clavicle into the axilla along the subclavian artery. Apart from these cases, it is rather surprising how com-

paratively rarely the *axillary glands* are visibly affected. Probably not more than 10 % of tuberculous glands in all parts of the body are in the axilla and only 5 % in the inguinal or femoral region. (Milton)

Sometimes, again, cases are met with in which almost every lymphatic gland in the body appears to be affected with tubercle. Such cases may resemble Hodgkin's disease; but in my experience, small glands excised with local anaesthesia for diagnostic purposes invariably show an area of caseation.

The presence of enlarged glands in the *inguinal region* must make one very suspicious of iliac abscess, early hip diseases, or, more probably, tubercle of the bones of the pelvic girdle, which will be described in a later section.

The general *diagnosis* of tuberculous glands from other glandular enlargements must be studied elsewhere. Unfortunately for the patient it presents but little difficulty here, where one is bound to start with the assumption that the disease is tuberculous unless it can be quite definitely proved otherwise.

Apart from the differences peculiar to this country above-mentioned, the *course and complications* of tuberculous cervical glands follows well-recognised lines, and all the general treatment for tuberculosis in ordinary must be adopted as completely as is possible, having regard to the patient himself and his home conditions. One practically never has the opportunity of watching the results of a careful hygienic dietetic and out-door treatment in hospital cases and has to trust simply and solely to cod-liver oil, maltine, Easton's syrup, Parrish's food and such-like general tonics, which are generally very irregularly and temporarily given. The tuberculin treatment of tuberculosis is hardly ever possible in Egypt owing to the difficulty of procuring a regular and constant supply of the necessary injections.

Almost every case of tuberculous glands, by the time advice is sought, has reached the stage when *operation* is the only possible treatment; and the earlier and more complete the operation the better the hope of cure. As a general rule it is advisable to make very free skin incisions, and in some cases to raise large apron-shaped flaps, so as to expose the area of operation as thoroughly as possible. The first incision generally lies either along the anterior or the posterior border of the sterno-mastoid muscle and is prolonged in any direction as required. A very good plan is to follow Watson Cheyne's advice and make first for internal jugular vein and begin the dissection for the removal of the glands from that centre. One does not hesitate to divide the sterno-mastoid muscle at any time to facilitate the removal of the glands beneath it, the spinal accessory nerve being carefully dissected out and protected before the division. All nerves must be preserved as far as possible, in the posterior triangle especially, but it may often be necessary to remove a considerable length of the internal jugular vein between ligatures, taking care that the vagus nerve is not in any way damaged or included in the ligature. Dissection is facilitated by the use of a metal dissector and also by the gloved finger covered with gauze sponges.

In operating on a large mass of glands in the posterior triangle a large skin flap may be turned up. The anterior incision starts just below the angle of the jaw and runs down the anterior border of the sterno-mastoid to within an inch of the clavicle. The incision then passes across the base of the neck nearly to the trapezius and then upwards to end near the posterior border of the mastoid process. When the flap is well turned up a start is made at the base of the posterior triangle, the platysma divided, the external jugular vein secured, and the whole triangle thoroughly cleared from below of all glands, fat and connective tissue, which is turned up in one piece, as in the dissection of the axilla in amputation of the breast. The spinal accessory is dissected out of the mass and also the posterior branches of the cervical plexus. The dissection is continued forward under the sterno-mastoid, which is divided, if necessary, and subsequently sutured, and the chain of glands lying along the internal jugular vein may be partially dissected out, the removal being completed from the anterior triangle at a later stage. This triangle is thoroughly exposed by transverse incisions carried forward from the anterior incision under the jaw above and to the middle line below, thus allowing a large square anterior flap to be turned towards the middle line of the neck. Starting now from the internal jugular vein below, the triangle is cleared in exactly the same way as the posterior. Finally the submaxillary triangle is cleared also, and in most cases the submaxillary salivary glands are removed as a matter of routine. Often the most difficult part of the operation is the clearing of the cervical part of the parotid gland, and of the space behind the upper end of the sterno-mastoid on the base of the skull and mastoid process. It is hardly necessary to emphasize the severity and the difficulty of these extensive operations, and only a knowledge of anatomy properly applied, and extreme care in operating, prevent what may otherwise prove very serious catastrophes. After completing the removal of the glands and connective tissue of the neck, as just described, the flaps are sutured, or clips are applied, and small drainage tubes are always inserted in the most dependent positions for at least forty eight hours. After painting the united edges with iodine, a good mass of double cyanide gauze wrung out in 1 in 40 carbolic, is applied and firm bandaging over a thick pad of dressing. The further treatment follows the usual lines and the results are usually very satisfactory. The operation above described must be modified as may be necessary to suit individual cases.

In only too many cases, however, it is not possible to perform a clean excision of the glands, owing to the presence of sinuses and much matting together and caseation of all the underlying structures. Modified operations must then be planned and in extreme cases, especially when associated with suppuration, incision, scraping and cauterisation of the tracks with pure carbolic and subsequent plugging with eusol gauze, is all that can be done for the moment, and more radical measures must be deferred till the local conditions are more favourable.

TUBERCULOSIS OF BONE. Tuberculous epiphysitis is not nearly so common in Egypt as in England. Apart from this condition, however, tubercle in bone presents most of the typical appearances but also occurs in some quite unusual seats which must now engage our attention.

The *sternum* is frequently affected and the tuberculous process often seems to originate on the posterior surface of the bone and comes forward by the edge of the sternum in the intercostal spaces. Eventually a collection of softened tuberculous granulation tissue presents at one side or other of the manubrium, or of the upper part of the gladiolus, and if left to itself may burst and leave a chronic sinus leading down to the bare edge of the bone. Very often, however, the whole of the upper part of the bone is involved in a rapidly spreading necrotic caries and, after removing the diseased parts by operation, one may see the margin of the pericardium exposed. In one case, in which the manubrium was alone affected, the upper portion of the ascending aorta and the beginning of the aortic arch could be seen pulsating in the depths of the wound. As these cases frequently occur in Soudanese they are particularly difficult to treat, and in all cases the progress of treatment is very slow. As free a removal as possible of the diseased bone is practised, the operation being followed by a long course of plugging with sterilized eusol gauze.

These cases in their early stage look like syphilitic gummata and, indeed, in other countries, would be; but they gradually soften and usually run the course we have described.

We will shortly draw attention to a peculiar *girdle tuberculosis* affecting the bones of the pelvic girdle, and more rarely a similar localisation occurs in the shoulder girdle also. Thus, the sternum, the inner end of the clavicle, and the scapula may be involved at one and the same time in a tuberculous necrosis, the shoulder joint and the head of the humerus escaping altogether. Each focus must be treated separately by the ordinary methods.

The *ribs and their cartilages* very often suffer from tubercle, the first sign of the disease being the formation of a cold abscess near or sometimes at some little distance from the original focus in the bone. When such cases are seen sufficiently early, the complete excision of the abscess and the portion of the rib responsible gives very satisfactory results. When, as generally happens, the abscess has already burst, or a sinus forms in connection with the diseased bone, very extensive removal of diseased soft parts of the rib, or ribs, or cartilages, has to be practised. Repeated operations are often necessary before a cure is effected.

Of frequent occurence also is tuberculous *dactylitis*, especially in the fingers, and with it is often associated disease of one or several of the carpal bones, which often paves the way to tuberculous disease of the wrist, through the medium of the carpal joints themselves. So rapid and progressive are these cases and so advanced before they reach us that amputation in the lower end of the forearm offers the only hope of success.

TUBERCULOUS DISEASE OF THE SPINE. is met with in all its many phases; and, except to note its severity and the very rapid progress it makes, needs no special description. As is to be expected, deformity is often allowed to become extreme and abscesses form and burst, and leave sinuses before treatment is sought; and paraplegia, from ignorance and neglect of treatment, comes frequently under notice. We have no essentially local method of treatment. All our tuberculous cases are given as much out-of-door treatment as possible and are all put on the open

PLATE 13.



Fig. 1.—An extreme case of Pott's disease in a characteristic attitude. P. A.



Fig. 2.—Tuberculous disease of the ankle. P.A.



Fig. 3. — Tuberculous disease of the knee-joint with dislocation of the tibia backwards. P. A.

terraces, where the spinal cases lie in a Phelp's box, with or without extension, or in a double Thomas' Splint. In view of the demand for beds most cases without abscess or other complication are sent out in a plaster jacket to be nursed in their own homes, a very unsatisfactory measure, I admit, but one which the absence of a large infirmary for chronic diseases in Egypt renders obligatory. Paraplegia is treated on the usual lines with absolute rest and massage to the paralysed limbs, but laminectomy after a fairly good trial is practically never done in these cases.

Our routine practice for *tuberculous abscesses,* whether purely subcutaneous or in connection with the spine or bone anywhere else, is as follows:— The collection is first aspirated under strict aseptic precautions, the contents withdrawn and the puncture sealed with collodion and gauze. If it refills, it is again aspirated. This aspiration may be done again and again until either the abscess is cured and does not refill or becomes septic. Should it refill, in spite of repeated aspiration, it is opened and completely excised, with its underlying rib or other bone, if of bony origin. If its removal is not practicable, the cavity is swabbed out with gauze swabs on a forceps and the walls rubbed till all, or as much as possible, of the soft lining membrane is removed. When the interior is made as dry as possible, the incision is completely closed with sutures and pressure made by properly applied dressing and bandages. If it refills the same operation is repeated in its entirety, and so on as often as may be necessary.

When aspiration is done, or when the abscess is opened by incision, iodoform, either as a 10 % sterilized emulsion with glycerine, or dissolved as a 5 % solution in ether, may be introduced and often with excellent effect. When the solution in ether is used it is introduced, and one must wait until the ether has evaporated before closing the cavity or sealing the puncture. Flakes of iodoform are then deposited over the wall of the cavity and are slowly disintegrated.

If it is not possible to excise a tuberculous abscess, as much as possible of the wall should be cut away, and the rest scraped with a sharp spoon and then closed or left widely open and made to heal from the bottom. Bipp is often very successful in such cases.

If the abscess in course of treatment becomes septic, it must be opened and drained, the subsequent dressing being done with the greatest possible care to prevent a further septic infection. No tuberculous abscess should be opened and drained unless it is absolutely impossible to do anything else.

Tuberculous bone disease is particularly common in the *lower extremity.* The *sacrum* is sometimes involved separately, but more generally as part of the disease affecting *the pelvic girdle.* The usual signs are long irregular sinuses in the buttocks over the sacrum, above the crest of the ilium, and in the groin and perinaeum, with or without lumbar or iliac abscess. The actual tuberculous foci are in the sacrum, the crest of the ilium and the rami of the pubis and ischium. Both the sacro-iliac and the hip joints are free and the actual disease is confined to bone. This girdle tuberculosis is particularly characteristic in Egypt and is nearly hopeless to effectively cure. Multiple operations for the removal of sequestra softened bone and sinuses are done and many subsequent

scrapings, but without much real success. Bismuth pastes, balsam preparations, iodine, iodoform and many other preparations are injected into the sinuses, but the most generally satisfactory treatment is to open up the parts as freely as is anatomically possible and try and treat the actual seat of the disease.

The *femur* is not specially affected, apart from its head in hip disease; but there are certain cases in which the disease is localised to the posterior surface of the lower end of this bone. The patient usually seeks admission to hospital because of a swollen knee, which is strongly flexed and fixed in that position, and a large abscess surrounding the lower end of the femur, or a series of sinuses leading down to necrosed bone. There is also some serous effusion into the knee joint, but, sooner or later, the joint becomes involved in the tuberculous process. Many of these cases come to amputation in the middle of the thigh.

EPIPHYSITIS is not often seen in the leg but the tarsal bones very frequently are involved, with sinuses round the heel and about the malleoli and, later, all the usual signs of advanced tuberculous ankle.

Extensive as is tuberculous bone disease in various parts, there is remarkable little *lardaceous disease* in Egypt, a fact somewhat difficult to explain.

TUBERCULOUS DISEASE OF JOINTS. In the last few years tuberculous disease of joints, and more particularly hip disease, has considerably increased in Egypt; and I find that in 1903 I referred in a paper on surgical tuberculosis in Egypt, read before the Medical Congress, to the rarity of hip disease. At the present time there is unfortunately no lack of such cases, and in this respect we are now rapidly approaching, if not surpassing, the average European figures.

Extreme cases of tuberculous joint disease constantly occur but taking average cases and considering the different joints, there are certain points well worthy of special mention.

Thus, the *shoulder* joint is very rarely affected in Egypt with tubercle.

TUBERCULOUS ELBOW is common and seems to begin rather as a necrotic caries of the head of the radius or olecranon than in the radiohumeral joint or general synovial membrane of the elbow joint.

TUBERCULOUS WRIST is not very often seen and is generally secondary to disease of the carpal bones and joints. Tuberculous taeno-synovitis rarely exists as a separate entity or as a forerunner to implication of the wrist.

SACRO-ILIAC disease, unless as part of a girdle tuberculosis, and secondary to tuberculous deposits in the sacrum, is uncommonly rare and I cannot remember to have seen a really typical case in Egypt. *Hip disease* now meets us round every corner, and one is distracted to know how to treat small children with firmly flexed hips, sometimes on both sides, the diseased one presenting a number of foul discharging sinuses all round the

upper end of the femur and buttocks. We do all we can by steady gradual extension and with as many as we dare, by straightening under an anaesthetic; while others require repeated scrapings, incisions for removal of necrosed bone, opening of septic abscesses, and, at long last, excision of the head of the bone, which is often the preliminary to an amputation.

We have to treat all these cases according to their condition, and when we are fortunate enough to have to deal with a comparatively early case our results, as evidenced by the increasing number of Thomas' splints we are having made, are really very encouraging.

TUBERCULOUS KNEES come to us very late, as a rule with the posterior dislocation of the tibia already existent. Our prospects of a satisfactory result are small from the outset. Too often the bones above and below are involved, and sinuses discharge, both from the joint and the bones, and there is very marked flexion of the knee on the thigh with a palpable dislocation. Sometimes even the ends of the femur have ulcerated through the skin. The photographs furnish a much more eloquent evidence than these lines, and the only possible operation is amputation.

TUBERCULOUS ANKLE does sometimes definitely begin as a taeno-synovitis but a bone focus, especially in the astragalus, is more generally responsible. Extreme degrees of the disease are again the most often seen, but, from time to time, an early excision of the astragalus by Kocher's method gives a good result. Most other cases come to amputation.

We are always as conservative as possible in the treatment of tuberculous joints and in early and possible cases follow the well recognised methods of treatment, with its general principles of rest and fixation after extension. Any operations on these cases are of very doubtful benefit as one very often finds on exploration that the disease has gone beyond all reasonable limits. Excisions, for example, are generally futile, and if any operation must be done at all, amputation must always be seriously considered. With time, cleanliness and patience it is extraordinary how many cases improve under conservative measures, though what is their ultimate fate, the great difficulties of tracing out-patients in Egypt make it almost impossible to decide.

TUBERCULOSIS OF THE TESTIS AND GENITO-URINARY TRACT. Tubercle of the kidney, the pelvis, the ureter, and the bladder are practically never met with in Egypt as primary conditions. The only common affection is tuberculous testis. This is seen at all stages and presents no special characteristics; except that care must be taken in its diagnosis, owing to the frequent presence of bilharzial nodules, and elongated masses in the substance of the spermatic cord. In tubercle, however, practically always, at the stage we see our patients, a nodule can be felt at the prostate of the same side. Later, the base of the bladder may become affected, and a cystoscopic examination often gives a very beautiful picture of multiple tuberculous nodules. Tuberculous testis seems to have a special tendency to occur on both sides at the same time, one equally as bad as the other. While here again one is as conservative as possible, removal of one and

often, later, the second testicle, has to be done, as frequently no advice is asked until one or other has become fungus testis. The cord is ligatured as high up as possible but no attempt is made to perform any of the more severe radical operations. The improvement in the general health of the patient after castration is often quite remarkable.

TUBERCULOSIS OF THE PERITONEUM.—Cases that come to us surgically generally present the usual character of miliary tuberculous peritonitis with effusion. They are fairly frequent and do well after operation. The most usual type, however, is that with much matting together of the intestines, and these cases are not benefitted by operation. In extreme cases of this nature the case comes to hospital with an umbilical faecal fistula and surgically are left severely alone. There are other cases with some temporary effusion in which the only evidence of tubercle found on laparotomy is a collection of tuberculous glands in the root of the mesentery.

It would have been easy to have written lengthy accounts of the various tuberculous conditions found in Egypt, but these, in the main, follow the general lines of tubercle elsewhere ; and I have only attempted to emphasize certain essentially local characters in the various forms of surgical tuberculosis that come under our observation in this country. The broad outlines of the whole subject must be studied in appropriate text-books.

LEPROSY is quite common in Egypt but presents no special local characteristics. Lepers are unfortunately still allowed to remain unmolested, as no Government measures have yet been taken for their isolation and treatment. Both nodular and anaesthetic forms are seen and very generally the two varieties of lesions are present in the one patient.

Surgically it rarely comes within our range, except to incise a slow unhealthy cellulitis of the foot or hand, or to remove a necrosed bone, or amputate an ulcerated or gangrenous finger or toe. In the hands the disease rarely extends beyond the fingers but in the foot it may involve the whole foot or extend into the leg. Such patients live a very long time with discharging sores or ulcerations, which gradually melt off a finger or toe. Leprosy must always be remembered as a possible cause of gangrene, cellulitis, chronic ulceration, or old scarring with varying degrees of mutilation of phalanges, hand or foot.

One sees also a peculiarly dry shiny bronzed skin in early cases of anaesthetic leprosy in which the presence of nodes and thickenings on the ulnar and other nerves gives the clue to diagnosis.

It is an unfortunate fact that many lepers in Egypt favour the calling of a cake or sweet-seller, and I have photographs of three generations of one family, all lepers, who were all living in the same house engaged in the fish-salting business, on the shores of Lake Borollos.

Too few cases of leprosy come under our notice to justify a detailed account of the disease ; but, in private practice, one is not infrequently called upon to treat cases of varying degrees of severity, and sometimes under particularly painful and difficult conditions. One of my cases, for

PLATE 14.



Fig. 1.—Nodular leprosy. P.A.



Fig 2.—Nerve leprosy. P.A.



Fig. 3. — The forearm and hand of the same patient as in Fig. 2. P. A.



Fig. 4. — Leprosy with marked atrophy of skin and mutilated fingers. P.A.



Fig. 5.—Macular leprosy. P,A.



Fig. 6.—Advanced mixed leprosy. P. A.

instance, after his condition had considerably improved under treatment, asked me to say that he might be married to a young and perfectly healthy girl. I refused my consent on general hygienic grounds; and, on my assistant pressing me for my reasons, I silenced his protests by inquiring whether he would give his consent to his own sister's marriage with our patient?

I wish therefore to give a short account of our present knowledge of the general management of leprosy, and the steps to be taken to prevent its spread; and also to outline the treatment of this dreadful disease.

The report of the International Conference on Leprosy held at Bergen in 1909 and framed by Dr. Newsholme and Sir Malcolm Morris, contains many useful suggestions and puts the position very clearly.

1. Leprosy is a disease which is contagious from person to person (though the mode of infection is not yet quite definitely determined).

2. It is desirable that lepers should be isolated.

3. Lepers should not be permitted to follow certain occupations which are particularly dangerous in respect to the contagion of leprosy; and leprous beggars and vagrants should be especially isolated.

4. The healthy children of lepers should be separated from their leprous parents as soon as possible and should afterwards remain under close medical observation.

5. All attendants and persons who have lived with lepers should be periodically examined medically.

In addition to these general statements the Conference also wish to point out that leprosy is spread by direct and indirect contagion from persons suffering from the disease. (The evidence in favour of infection through insects, and especially bugs, appears to be becoming more convincing.) Dirt and overcrowding and close and protracted association between the leprous and non-leprous are important subsidiary factors. Leprosy is not due to eating any particular food, such as fish. It is not hereditary. Several members of one family may acquire the disease by contagion. Some years may elapse between infection and the first recognised symptoms. It is essentially a disease of long duration, but may have quiescent stages and then recur. The danger of infection is increased from a leper when there is any discharge from mucous membranes or from ulcerated surfaces. All cases should be notified and all lepers segregated in properly equipped camps; but with proper precautions, certain patients may be allowed to live at home.

These statements well indicate the general lines of state and private management of the disease from a public health point of view and we must now briefly describe the *treatment* to be followed.

General and local personal cleanliness is very important. Frequent warm baths, to which cyllin or lysol ($\frac{1}{2}$ %) has been added must be ordered; and the ulcerations must be dressed with eusol fomentations and later with balsam of peru ointment, 10 % in oil arachis or lanoline. In fact, all the different local lesions are to be treated like any other septic wound or ulceration, and we must not be frightened or put off by the fact that the condition is due to leprosy. A nasal douche of glycothymoline or a diluted cyllin solution ($\frac{1}{4}$ %) is ordered twice a day and antiseptic mouth-washes or gargles as may be necessary. A very good mouth-wash is made

of 1.0 of iodide of potassium in 20.0 of tinctuıe of iodine (10 %) a few drops of which are added to half a glassful of warm water. Ulcerations in the mouth may be touched with pure carbolic or chromic acid from time to time to stimulate healing.

The local treatment is entirely secondary to a thorough *general treatment*. This consists in the administration of chaulmoogra oil in various ways. The most convenient is by means of gelatine capsules, each containing 0.30 or 0.50 of the oil. It is best to start with the smaller dose and give one capsule twice a day immediately after meals, night and morning. As the stomach becomes accustomed to the drug, which is very nauseous and disturbing to the digestion, a third capsule is given after the mid-day meal. Cautiously the dose is increased until as much as two of the larger capsules are taken three times a day (3.0) and even this dose may be considerably increased by easy stages.

If nausea or vomiting occurs the oil may be given in a capsule with anaesthesin as follows:— Chaulmoogra oil 0.30, anaesthesin 0.025, menthol 0.0015; but, in my experience, with care and gradual increase of the dose, this special formula is not necessary. Moreover, if the stomach rejects the oil it is best given subcutaneously. It may also be given by rectum in larger doses mixed with warm milk.

Some patients take the plain oil quite well and it is then best given in warm milk or aniseed or carraway water.

When the case can be kept under constant supervision, the oil may be given subcutaneously, or even intravenously. Heiser has obtained very good results from intramuscular injections of chaulmoogra oil combined with camphorated oil and resorcin (Rogers). The best formula for these injections appears to be the collobiase de chaulmoogra (Dausse) which contained 0.00072 of the oil in 1 c.c. A very good scheme of treatment is proposed by Vahram. He begins a first intravenous injection of 1/4 c.c. and increases it progressively 1/10 c.c. at a time up to 2 c.c. Twenty injections are given and then stopped in favour of the subcutaneous injections, of which twenty are given starting with 1 c.c., increasing by 1/2 c.c, until by the twentieth injection 5 c.c. are given. Then go back to the intravenous treatment and so alternate them till a definite improvement results.

Rogers has recently reported good results from the intravenous injections of 2 % solutions of gynocardate of soda—British Medical Journal for October 21st 1916 — and treatment carried out on his lines has already given very encouraging results in Kasr-el-Ainy.

I have tried the injection, also subcutaneously, of nastine B as recommended by Deycke but cannot say I have ever seen any good result from it and I invariably return to the chaulmoogra with much more confidence.

Any treatment has to be continued for many months, or even years, and must be supplemented by cod-liver oil and tonics throughout. I generally give iron and arsenic pills with good effect; and taka-diastase tablets are very useful to keep the digestion in good order. Neuritic pains may also require full doses of salicylic preparations and iodide of potassium.

Finally no case of leprosy must ever be considered cured but must be kept under constant observation and a fresh course of treatment prescribed at the first sign of recrudesence.

VII.—TUMOURS AND NEW GROWTHS.

In dealing with the subject of tumours in Egypt, one is impressed by their peculiar distribution in general, especially in malignant types, and the extraordinary size the growth has attained before treatment is sought. This, perhaps, is not surprising with such an ignorant and indifferent people, and it necessitates the practice of much 'heroic' surgery to deal with the condition with any hope of success. In hospital practice, many cases are operated upon—and often with a very gratifying measure of success — which elsewhere would be considered beyond the range of effective surgery, and be subjected only to X-rays or other similar measures. If we were not to do these doubtful cases, our students would be only too ready to think that operation is not possible in *any* case and protect themselves, when called on to deal with these severe conditions, by quoting their teachers, who had never operated on advanced cases during the term of their hospital life. There are limits, of course, but I wish to point out that in Egypt, and in other parti-civilised countries, the surgeon must be prepared to carry out far more extensive operations than might be considered justifiable in a country where cases come under observation at a much earlier stage of the disease.

Moreover, some partial and admittedly incomplete operations have to be done, to relieve pain or prevent haemorrhage, without any hope or intention of removing the whole growth. Such operations very considerably add to the comfort of the patient stricken with a mortal disease and are justifiable on that score alone. A case which illustrates this point very well was that of a lady whom I saw with a great mass of glands in the groin, secondary to an epithelioma of the vulva which had been removed some months previously. The gland had ulcerated through the skin and threatened to open into the femoral vessels, and there was constant and very severe pain. I was able to remove the greater part of the mass and to close the wound, by undermining the skin above and below, with great relief to the patient. She no longer had the fear of haemorrhage and completely lost her pain. The wound healed almost entirely, and she died three months later, quite peacefully, from metastatic growths in the lungs.

As an introduction to this section I may well quote my colleague Day, from his paper on "Hospital work in Egypt", in the Lancet of Jan. 23rd. 1909. He writes :--

"The influence of race and climate on the incidence of new growths, especially carcinomata, is well exemplified in Egypt. Simple tumours are found in the same proportion as at home, with the exception of the uterine myomata, which are well known to be specially frequent among the Soudanese. Out of 33 patients admitted for myomata during the last two years (1907-8) no less than 8 were Soudanese, a ratio of 1 in 4, whereas the ratio in total admission is only 1 in 40. Malignant tumours show a preponderance of sarcomata (43 cases last year) and surface carcinomata (29 epitheliomata and 8 rodent ulcers) over glandular carcinomata (24 cases). Epithelioma affects the usual sites, most commonly the tongue (4), lip (7) or old scars (4). An interesting case of genuine epithelioma of the tongue cannot have exceeded 16 years. Unfortunately, a large proportion of the patients came with the disease too far advanced for radical treatment. Glandular carcinoma is uncommon, and only 6 cases of mammary cancer were admitted. The uterus was the seat of the disease in 4 patients and the stomach in

only one. Carcinoma may follow on the chronic irritation of bilharzial disease. Thus two cases of cancer of the rectum and four of the bladder appeared to be implanted on bilharziosis. At one time this condition was believed to be far commoner, since the hard infiltrating masses of bilharzial tissue often simulate cancer very closely, and the diagnosis of suspicious cases depends almost entirely on the microscope."

That these statements still hold good at the present day is evident by referring to the statistical report of Kasr-el-Ainy for 1913. Thus there were 59 carcinomata and 35 sarcomata, out of 1710 surgical diseases admitted to hospital, and 2 sarcomata of orbit. Gynaecologically there were 18 myomata ; and only 1 epithelioma of cervix and 1 sarcoma of uterus.

Before referring in detail to the different types of tumours met with in Egypt, I wish to make certain general observations with reference to the *incidence and situation,* especially of malignant growths, in special areas.

We formerly were disposed to think that malignant disease was quite rare with us ; but when some years ago we prepared careful statistics for the Cancer Research Committee, it became evident that the incidence of both sarcoma and carcinoma was but little different to that of European countries, admitting that our cases, as a general rule, are much advanced and altogether on the "big" side. We found that, apart from their size, the general pathology, appearances, progress and prognosis of Egyptian tumours differ but little from the standard European types.

Beyond that induced by bilharzia ova in certain tissues, as in the mucous membrane of the bladder or rectum, "*irritation*" cancers are rarely observed ; and the cases of malignant disease we see are due entirely to the uninfluenced growth of cancer cells of various types.

The *colour of the skin* seems also to be a factor in the development of cutaneous malignant growths. A loss of pigment, either congenital or acquired, is a source of danger in the naturally dark-skinned races. We have lately had two cases of epithelioma starting in the skin of the posterior triangle of the neck, with secondary glands deeper down, in *albinos,* and in one of them the scalp also was the seat of a large epithelioma. (The Arabic for albino is "aadooh-el-shams" which is, literally, "the enemy of the sun", a particularly apt designation in this country where, with the constant and intense glare of the sun in the summer, an albino has a particularly bad time.) We have also an old woman who has developed an epithelioma of the lip, apparently beginning at the margin of a path of leucoderma, with which disease she is severely affected. On the other hand pigmented moles, other potential foci of cancer, are fortunately not at all common.

Malignant disease, carcinoma in particular, often occurs at a very *early age* and during last year we had a case of epithelioma of the tongue in a boy of twelve, and this year in a girl even younger. Cancer of the breast is often very early also.

PLATE 15.



Fig. 1.—Epithelioma of neck, originating in a pigmented mole, in an albino.



Fig. 2.—Epithelioma of scalp with enlarged pre-auricular glands. P.A.



Fig. 3.—Extensive rodent ulcer of the ear. P.A.



Fig. 4.—Rodent ulcer involving the whole eye and destroying the lids, conjunctivae, and cornea. P.A.

Cancer of the *stomach* is very rare indeed, as is the case also with cancer in any part of the intestinal tract from the oesophagus downwards. One sees a very occasional case of sarcoma or carcinoma of the caecum, and of sarcoma of the retro-peritoneal glands. The uterus is largely exempt. Thus, in 1913, of 2906 medical admissions, there were 4 cases of malignant disease of the abdomen, two of cancer of the pylorus, two of the fundus of the stomach, two of the head of the pancreas, and one of the oesophagus. No cancer of the gall-bladder was found and only one case of the liver.

I have seen several cases of primary sarcoma in the *muscles*, especially in the biceps, both of arm and thigh. These often grow to a considerable size and are generally confined to the original muscle affected. Complete removal of this muscle and its sarcoma, with grafting of the tendon into its neighbours, has been satisfactory in our cases; but this can only be done in comparatively early cases, when no more extensive involvement has occurred.

Sarcomata of *bones* are common enough, but except for their excessive size present no special local characteristics.

REGIONAL DISTRIBUTION OF MALIGNANT DISEASE.

HEAD & NECK. In looking through my notes and photographs I have been struck by the very large proportion of cases of malignant disease about the head and neck; and it will be well to devote our attention first to the clinical and operative aspects of these conditions. On the *scalp* three types of malignant disease call for detailed notice. EPITHELIOMA occurs in two forms, one with a low-lying raised indurated circle of epithelomatous growth around a denuded piece of bone; and the other as a large rapidly growing fungating mass, resembling a burst sebaceous cyst which has undergone malignant change. In both forms the bone is bared of periosteum and is slowly eroded; and secondary glands are found, either in front of the ear over the parotid or at the posterior margin of the mastoid process and sterno-mastoid. Operation is generally unavailing, and if it is attempted must include a free removal of the infiltrated bone and of the glands.

RODENT ULCER is especially seen above and behind the ear and has usually already destroyed the greater part of the cartilage of the external ear. It has the typical characters of this disease on a large scale and the bone is generally exposed, to a varying extent, and is much worm-eaten. Very free removal of the ulcerated area and the bared bone must be practised, if it is at all possible, followed by grafting later.

SARCOMA, generally starting from the bones of the skull, especially the parietal and occipital, is less common, and shows itself first like a sebaceous cyst which rapidly increases in size, becomes pulsatile, and may even have burst and formed a large fungating mass, in the depths of which the bone has been extensively destroyed and the dura mater widely infiltrated. Only in very early cases, before perforation of the bone has been effected, can one hope for any satisfactory result from the wide removal of the growth and of the underlying bone. It is wise to

remove all cysts or lumps on the scalp as soon as they start to increase in size, and, at the same time, to examine the tissue deep to them, whether it be aponeurosis periosteum or bone.

Coming down to the *Orbit* we have frequently to deal here with cases of SARCOMA, sometimes melanotic in structure, or EPITHELIOMA starting in the conjunctiva or lids, or advanced RODENT ULCER.

The SARCOMATA may originate entirely behind the eye-ball and produce a very marked proptosis; or they may have already involved the globe and destroyed the eye completely, and present as an enormous fungating mass, projecting from the orbit and tending to ooze a good deal from the granular surface of the growth.

The EPITHELIOMATA may destroy by ulceration all the anterior part of the eye and spread extensively; or may grow very rapidly into a firm but still fungating mass much like the sarcomata. The glands in front of the ear and others in the anterior triangle of the neck are secondarily involved.

RODENT ULCER has a particularly characteristic appearance in this situation. Both lids and the conjunctiva may be destroyed by a shallow ulceration, which very soon contracts, and a shrivelled retracted eye, seen perhaps behind a portion of still unaffected lid, is the striking feature of this condition. The ulcer itself may be quite small and not exceed the limits of one or both lids; but at times it has spread very widely on to the face, after destroying both lids and the inner and upper parts of the nose. Women are often the subjects of this form of rodent ulcer.

The only possible *treatment* of all these orbital conditions is a very complete evacuation of all the contents of the orbit; but one never can tell the extent of the implication of the bones of the orbit, or of the outer wall of the nose, until the eye is removed and, consequently, no opinion as to prognosis and hope of cure before operation is of any value.

With the *post-orbital sarcomata* the lids may be left, but the whole contents of the orbit, including the periosteum lining the bones of the cavity, must be completely removed, and, if necessary, any affected portions of the bones of the walls of the orbit.

Very rarely the growth in the orbit may be secondary to sarcoma of the upper part or nasopharynx, in which case no further operation is possible.

In favourable cases the cavity is plugged with cyanide gauze and allowed to granulate; and, later, large thin Thiersch shavings of skin may be engrafted on to the granulations of the walls of the cavity.

In *fungating sarcoma* a good margin must be removed all round the growth well beyond the supra-orbital and infra-orbital ridges. The incisions are deepened to the bones and then the whole orbit cleared down to the actual bony wall itself. Any infiltrated bone must be dealt with as necessary. The operation in these cases may be completed by undercutting and sliding the skin off the bones, as upper and lower flaps, and

PLATE 16.



Fig. 1.—Protruding sarcoma of the orbit. P.A.



Fig. 2—Sarcoma of orbit treated by enucleation of the whole of the contents of the orbit.



Fig. 3.—A large mass of secondary glands after the removal of the contents of the orbit for epithelioma of the eye.

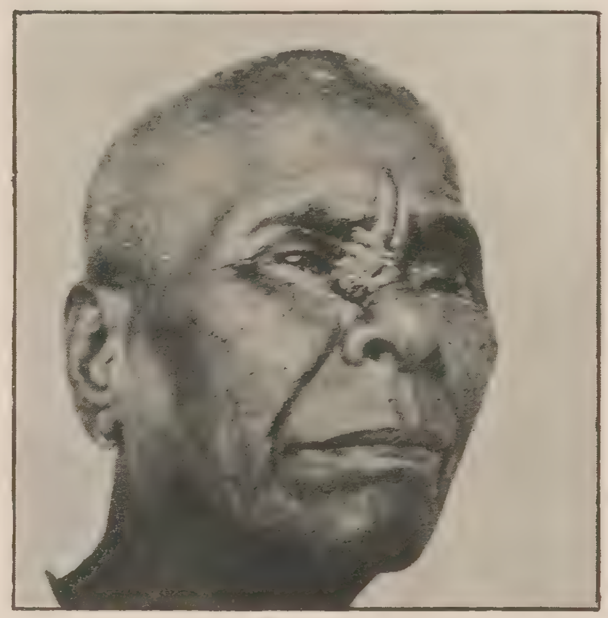


Fig. 4—Rodent ulcer of the nose. P.A.

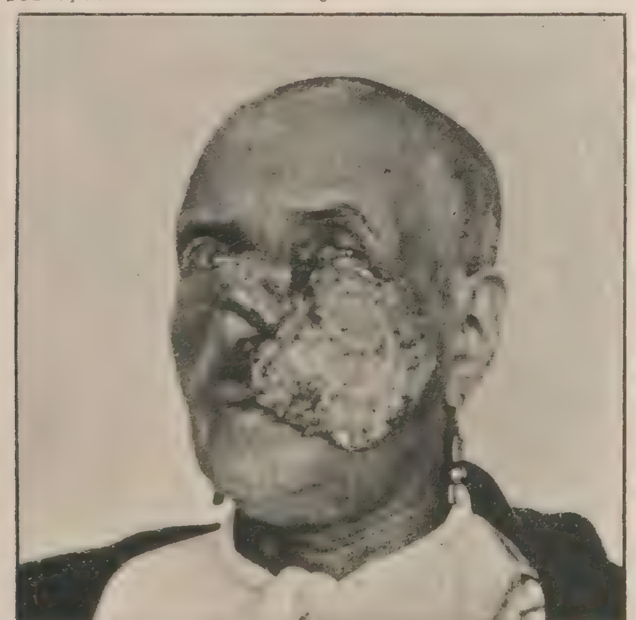


Fig. 5.—Epithelioma of the upper lip and face. P.A.



Fig. 6.—An extreme case of sarcoma of the upper jaw originating in the antrum. P.A.

suturing the cut edges over the front of the emptied socket, leaving only a small opening at the outer end of the sutured wound for a narrow strip of gauze, with which the cavity is very lightly packed. The results are often quite good and the closure of the orbit is well worth trying whenever it is possible to approximate the flaps.

One cannot attempt to guarantee a complete removal of the growth in cases of *epithelioma,* in which also the removal of the glands must not be forgotten. In most cases it is advisable to attempt removal by operation similar to that just described for sarcoma, and when the disease is still confined to the eye and the skin of the lids, a good result may be obtained. The relief is always considerable and the risk of haemorrhage from the surface of the ulcerating mass is removed.

In *rodent ulcer,* when confined to the lids, the complete emptying of the orbit is very satisfactory; but, in the more extensive cases, the result will depend entirely on the extent of infiltration of the various bones of the orbit and nose, and the possibility of the complete removal of the disease.

In actual practice we meet with but few cases in which it is not possible to operate in the way we have advised, either with a good prospect of cure or as a thoroughly justified palliative measure.

On the *face* itself rodent ulcer often produces extensive destruction. It is, as elsewhere, especially common in the middle third of the face and frequently leaves an excavated cavity into the nose and inner margin of the orbit. Women are affected as often as men, and, generally, it occurs at an earlier age than in England. (The question of age must be considered in relation to the precocity of Eastern peoples and to the fact that, owing to this earlier development, marriages often take place at the age of fourteen ; the patient is often literally older than his years.)

Save for its advanced condition rodent ulcer keeps to the ordinary lines and, in the absence of X-ray treatment, is removed by operation, whenever it is possible to do so.

I have also seen a peculiarly wide-spread *epitheliomatous growth* on the face more than once, the main features of which are well seen in the accompanying photograph.

Reference must be made in connection with ulcerations of the face to the section on tertiary syphilis, both congenital and acquired, but with us superficial ulcerations of this nature are not at all commonly seen.

Similarly we shall later refer to a peculiar condition of the nose akin to *rhinoscleroma* which I first elsewhere described under the title of ‘quiet polypoid sarcoma of the nose.’

EPITHELIOMA OF THE LIPS occurs particularly in men but also in women ; but the time-honoured causal aid of the short clay pipe cannot be invoked in Egypt as it does not exist. This condition often produces very marked destruction of the lip, or lips, and presents as a luxurious fungating mass ; but, at other times, it follows the ordinary orthodox lines and must always be distinguished from granuloma labialis described

in an earlier section. If epithelioma of the lip is within the range of operation the procedure follows the usual methods and extensive plastic operations may follow. A secondary involvement of the lower lip, from a primary epithelioma of the floor of the mouth and the lower jaw, sometimes gives rise to a dreadful hard massive growth, projecting from the chin and involving also the glands and soft structures of the front of the neck to quite a hopeless extent.

Sometimes one sees an enormous swelling of the upper part of the face and eye from neglected SARCOMA OF THE UPPER JAW. Occurring, as they generally do, in children, the swelling occupies all the side of the face and head and the eye may be displaced upwards and outwards in a horrible way. There is but little projection of the palate into the mouth but the whole of the naso-pharynx is filled with growth. Operable cases of sarcoma of the upper jaw are occasionally met with, but such as we have just described are quite beyond all surgical aid. In a recurrent case after operation we have recently had considerable improvement in the mass itself and in the surrounding swelling by repeated injections of Coley's fluid.

Rarely a MALIGNANT PAROTID GROWTH is seen forming a large rounded tumour in the parotid area and neck.

TUMOURS OF THE LOWER JAW.—EPULIS is frequently seen in either lower or upper jaw ; and though undoubted, and even partially pedunculated fibrous epulides do occur, they are generally under grave suspicion and are,or readily become, *sarcomatous.* If seen at a reasonably early stage excision of the epulis with a wedge-shaped piece of the underlying bone is practised ; but one is far more likely to have to deal with a well-developed sarcomatous mass, for which nothing short of excision of a portion of the lower jaw is possible. These masses may be multiple.

Other tumours are obviously *epitheliomatous* and must have started in the mucous membrane of the floor of the mouth or inside the jaw. They infiltrate the bone of the lower jaw about the symphysis, and the glands and all soft parts of the neck down to the thyroid cartilage, welding all these parts into a hard irregular fleshy mass quite beyond any treatment.

Other tumours of the jaw and teeth are pathological curiosities in Egypt.

EPITHELIOMA OF THE TONGUE generally reaches us in a hopeless condition, with fixation and infiltration of the whole floor of the mouth, and with deep and extensive glands, or ulceration far back on to the soft palate and jaws. It occurs too often at quite an early age. It is only rarely engrafted on to an old tertiary syphilitic ulceration. A Wassermann is always done in these chronic ulcerations of the tongue and anti-syphilitic treatment adopted, if it should prove to be positive ; not with any hope of cure but of eliminating the syphilitic element and clearing up the ulcer, which it often does in quite a remarkable way. After confirming the diagnosis of epithelioma by the microscope, the usual operation, when it is possible, consists in clearing the submaxillary triangles both of lymphatic and salivary glands and ligaturing the facial arteries en route

PLATE 17.



Fig. 1.—Sarcoma of lower jaw. P.A.



Fig. 2.—Sarcoma of lower jaw, parotid, and soft parts of face and neck. Note also mass of sarcomatous glands in pectoral region. P. A.



Fig. 3.—Extensive malignant parotid tumour. Photo : Dr. Diay.



Fig.4.—Side view of ame patient as in Fig. 3



Fig. 5—Epithelioma of lower jaw and floor of mouth. P.A.



Fig. 6.—Osteo-sarcoma of lower jaw.

at the lower margin of the jaw. The anterior triangle is cleared also in well-marked cases, and then both lingual arteries ligatured. In advanced cases the external carotid on the affected side may be ligatured also, but care must be taken to ligature *both* linguals even in this case, so as to prevent the possibility of haemorrhage by way of the communications with the lingual artery of the sound side. The tongue, or part of it, and the floor of the mouth, as necessary, is then removed through the mouth by a bloodless operation. If it is necessary to remove any portion of infiltrated bone an attempt must be made to leave the point of the bony chin intact and not to split the jaw in the line of the symphysis. It is often enough to remove the portion of bone carrying the four incisor teeth by boring a series of holes close together just below these teeth, and parallel to the alveolar margin, and by sawing, or cutting with bone forceps, down between the lateral incisors and the canine on either side. The oblong piece of bone bearing its four teeth is then detached; and with it the mucous membrane of the floor of the mouth and the tongue can be removed in one piece, (Clayton-Greene.) All tongue cases and, indeed, all operations on the mouth generally, should be sat up in bed as soon as they are round from the anaesthetic, and kept up, so as to prevent the very real risk of septic broncho-pneumonia. A preliminary injection of pneumococcus vaccine should also be given. The mouth is kept constantly washed out with permanganate, oxygen water or iodine mouth washes.

SARCOMA OF THE TONSILS has been seen alone or as the starting point of a diffuse lympho-sarcomatosis of the neck.

THE NECK. Secondary EPITHELIOMATOUS GLANDS in the neck do not generally assume large proportions, but must always be suspected as such in unexplained cases of glandular enlargement.

Sometimes masses of LYMPHO-SARCOMATA are seen, starting in the glands of the anterior or posterior triangles of the neck, and forming enormous soft elastic tumours. The rapid growth and the soft massiveness of these swellings are very suggestive and the diagnosis is confirmed by excising a small adjacent gland and examining it with the microscope. These gigantic tumours must not be touched; and it is generally equally unsatisfactory operating on the smaller chains of rapidly-enlarging lympho-sarcomatous glands which occur frequently in other parts of the neck. Multiple operations may be performed, but always there is recurrence, until nothing further is possible and death occurs rapidly from both glandular and visceral dissemination. Sometimes these massive lympho-sarcomata are very hard, partly from their own structure and partly from being covered by the deeper muscles of the neck.

The *thyroid* may be the seat of a very rapidly-growing SARCOMA or CARCINOMA, and with the latter I have seen secondary deposits in the sternal end of the clavicle and also in the bones of the skull, as well as in the glands throughout the neck. Such tumours are usually beyond all hope of operation, owing to their fixation to all the deeper structures of the neck and their extraordinary vascularity. Any thyroid swelling in which the overlying skin is stretched and marbled with large veins, and in

which the growth is obviously not only attached to the sterno-mastoid but to the structures beneath it and to the trachea, should be left severely alone ; and also treated with great respect and care when a tracheotomy may be required to relieve an increasingly urgent respiratory obstruction.

THE CHEST WALL ABDOMEN AND BACK. The *breast* is occasionally the seat of a very rapid SARCOMA, especially in young nursing mothers; but the usual type of malignant disease is the SCIRRHUS CARCINOMA. Here again advanced cases are the rule, and one very rarely sees an early movable mass. On the contrary ulceration has frequently already occurred, or the growth has become a "*cancer en cuirasse*" in various stages of progress. Implication of the underlying muscles is usually present, but except in *very* advanced cases, the chest wall is not visibly affected. The enlargement of the glands in the axilla varies considerably, and they are not generally a striking feature of the case. The cervical glands also participate, especially in deep-seated infiltrations and with marked ulceration. Many of these cases also show great lymphatic oedema of the axilla and upper extremity, an indication in itself that the disease has progressed to an altogether hopeless and inoperable stage. Some years ago I reported a series of four cases, in the Records of the School of Medicine, of inoperable cancer of the breast treated by double oophorectomy but without any real benefit; and I have tried the effect of lymphangioplasty for the swollen arms without more than quite a temporary improvement.

The operation for excision of the breast we are accustomed to do for a possible case, follows the lines of Sampson Handley's procedure, but it is only rarely that sufficient skin can be saved to effect a complete closing of the wound. In general a large raw surface is left which is grafted later. I think this method is preferable to an elaborate flap cutting from the chest wall or abdomen, as, by waiting till granulation is proceeding, one can see whether any of the growth has been left behind, and if so, remove it before grafting. When there is plenty of skin on the front of the chest a long flap can be slid across by undercutting; and in one case, I have even pulled the flap over so far laterally, until the healthy breast occupied the position from which the diseased one had been removed.

It will be readily understood that nothing short of an 'heroic' operation will effect a sufficiently thorough removal in these advanced cases of cancer of the breast, and especially when they have become "*cancer en cuirasse*". With all our efforts visceral metastases are liable to occur—not as frequently, however, as one would expect—either in the liver or the bones. I have had a case recently of a metastasis in the lower part of the lumbar spine, producing double sciatica and gradual paralysis, a year after the operation on the breast.

DUCT CARCINOMA and PAGET'S DISEASE are almost non-existent; but lately I have had a case of very wide-spread cancerous *infiltration of the lymphatics of the skin*, after what was evidently an incomplete amputation of the breast for cancer. The lymphatics of the skin and the epithelial layers were full of cancer cells and, so superficial did the whole area of dermatatis appear, that we attempted its removal in sections.

PLATE 18.



Fig. 1.--Cancer of the tongue in a girl of 10, showing only the enormous enlargement of the glands of the neck.



Fig. 2.---Sarcoma of neck, not starting in glands but forming a soft encapsuled mass in the sub-cutaneous tissues.



Fig. 3.--General lympho-sarcomatosis. P.A.



Fig. 4.—Lympho-sarcoma of neck.



Fig. 5.—Lympho-sarcoma of neck. P.A.



Fig. 6.—Lympho-sarcoma of neck.

PLATE 19.

Fig. 1.—Cancer of the breast with involvement of the overlying skin. P.A.



Fig. 2.—Inoperable cancer of the breast treated without benefit by double oophorectomy. P. A.

PLATE 20.



Fig. 1. - Advanced ulcerated cancer of the breast with marked lymphatic oedema of the arm. P.A.



Fig. 2.—Cancer of the lymphatics of the skin after incomplete amputation of a cancerous breast.



Fig. 3.—A bad photograph of cancer of the male breast. P.A.

PLATE 21.



Fig. 1.—Sarcoma of the subcutaneous tissues of the back. P.A.



Fig. 2.—Sarcoma of glands and subcutaneous tissues of the groin. P. A.



Fig. 3.—Sarcoma of the biceps muscle of the thigh. P.A.



Fig. 4.—Periosteal sarcoma of the upper end of the tibia.



Fig. 5.—Advanced osteo-sarcoma of the lower end of the humerus.

PLATE 22.

Fig. 1.—Enormous chondro-sarcoma of the upper end of the humerus for which a fore-quarter amputation was done. P. A.



Fig. 2.—The same case one month after operation. The curve of the chest wall in the absence of the scapula is well seen. P. A.

PLATE 23.

Fig. 1.—Chondro-sarcoma of lower end ofradius.

Fig. 2.—An X-ray photograph of the same, showing the details of the structure of the tumour, by Dr. Diay.

Eventually we were able to remove the entire mass and grafting was successfully performed; but unfortunately, a secondary deposit developed in the cartilage of the sixth rib on the opposite side, and at the moment of writing the outlook for the future is not at all hopeful.

Four cases of cancer in the *male* breast have been observed.

SARCOMA originating in the *subcutaneous tissues* or perhaps the muscles, sometimes occurs in the back and presents a very typical appearance (see photo). I have sometimes been able to completely remove the large fleshy mass and have not found it had any attachment to bone or muscle, though the aponeurosis was dissected off the underlying layer of muscles.

The rarity of *abdominal malignant disease* has already been referred to and needs no further comment, and intestinal and vesical cancer secondary to bilharziosis will be described later.

THE LIMBS.—SARCOMA OF THE BONES of the extremities has no special peculiarities, apart from its size, and is fairly common. Both periosteal and endosteal types do occur and are treated as the occasion demands.

Mention must also be made of the frequency of the development of EPITHELIOMA ON OLD SCARS and especially in a contraction from old burns. The glands in the groin or axilla—it is generally found in the legs—are involved also, and nothing but amputation, with the removal of the glands, is possible. In cases where the whole cicatrix has been eaten away by the ulceration, the case must not be mistaken for ulcerating parasitic granuloma; but the infiltration and ulceration of the underlying muscles or aponeurosis is all in favour of epithelioma and the microscope will confirm the diagnosis.

GENERAL INCIDENCE OF BENIGN TUMOURS. Considerable space has been devoted to the consideration of the local features of malignant disease in Egypt, as cancer is much more important surgically than any variety of benign tumour; and it now only remains for us to briefly mention the more essential local peculiarities, in incidence or appearance, of these less harmful tumours.

LIPOMATA, both localised and diffuse, are not rare and may be multiple. I have taken my turn in removing over eighty of these tumours in a patient who was extremely anxious for us to do so.

Lipoma hernia originating in a sub-serous lipoma and presenting through a hole in the linea alba is particularly common and requires careful treatment by early operation.

I am including a photograph of an enormous *lipoma on the back* of a water-carrier which almost looks as if his goat-skin water-bag had become permanently fixed to his back. A satisfactory removal of the enormous mass was effected.

In fat old ladies, especially those whose life is spent entirely within the harem, a peculiar condition akin to *adiposis dolorosa* is common. Large masses of fat accumulate behind the thighs and knees. They are very painful and are generally associated with much grating in the knee joints, from osteo-arthritis, and sometimes in other articulations also. The patient is often literally a mountain of fat and suffers considerably from neuralgia-like pains, which appear to originate and have their being in these enormous fatty masses. It is an exceedingly intractable condition, and the best, if any, results are obtained by a strict anti-uric acid and anti-fat regime.

Good examples of FIBROMATA, especially as molluscum fibrosum, are seen, and some quite extraordinary examples of multiple subcutaneous tumours of this nature. Other than these, fibromata are quite European in their incidence and behaviour.

CHONDROMATA occur as multiple growths of the fingers ; but more frequently as very large single tumours at the ends of the humerus or tibia, and occasionally in other bones. These have usually assumed such enormous proportions that amputation at the joint above is all that is possible, as the end of the bone is found to be completely replaced by cartilaginous growth with a strong suspicion of commencing sarcomatous change.

OSTEOMATA are quite rare, and those I have seen were multiple, except for one large mass on the frontal bone.

NEUROMATA as such hardly ever occur, but any thickening in the course of a nerve at once arouses suspicions of leprosy.

ANGIOMATA are curiosities and I have only seen two cases of CYSTIC HYGROMA, one in the neck, the other above the right buttock. A very marked case of thick lower lip from LYMPHANGIOMA was operated on several times and another was seen on the tongue.

ENDOTHELIOMATA of the parotid and testis occur sometimes and may remain as they are or suddenly take on a rapid growth from probably sarcomatous implication.

LYMPHADENOMA of the cervical and, rarely, other glands is more often diagnosed than confirmed, as so often we find that these general glandular enlargements, due to so-called lymphadenoma, with or without suspected Hodgkin's disease, are tuberculous.

Figures have been given of the general incidence of MYOMATA in hospital practice, but these are entirely of gynaecological interest.

PAPILLOMATA wherever they are, must always be looked upon with suspicion as there are so many possible causes of warty growths in Egypt. Among these bilharzia irritation, spirochaetosis, and Leishman-Donovan bodies may be mentioned. True papillomata do occur and have no special peculiarities.

ADENOMATA in the thyroid prostate and breast, variously mixed with fibrous and other tissues, occur, but have nothing essentially Egyptian, except that in the mammary variety the early stages are rather conspicuous by their absence, as in most cases they have already taken on carcinamatous change.

All other forms of benign tumours are very uncommon and possess only a pathological interest. They are dealt with on ordinary surgical principles.

PLATE 24.



Fig. 1.—Pedunculated lipoma of axilla. P. A.

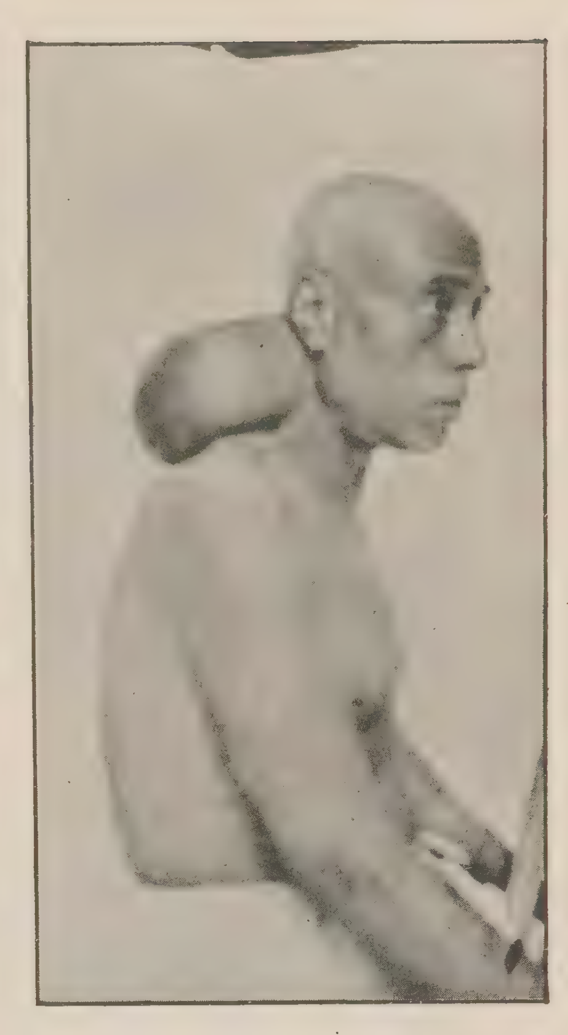


Fig. 2.—Lipoma of neck.



Fig. 3.—Lipoma of back in a patient who was a water-seller. The resemblance of his tumour to his 'qirbah' will be apparent to all Egyptians. P.A.

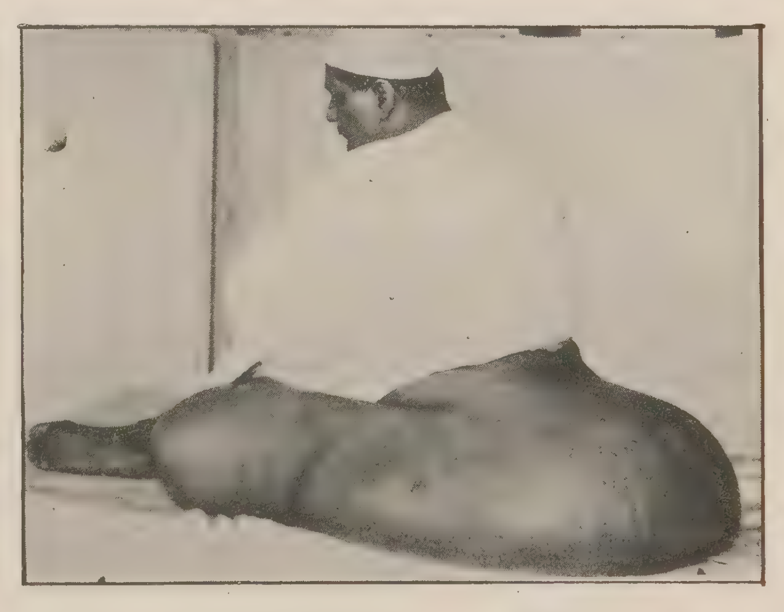


Fig. 4.—Diffuse lipomatosis. An old patient and neighbour.

PLATE 25.


Fig. 1.—Diffuse fibromatosis. P. A.


Fig. 2.—Molluscum fibrosum.


Fig. 3.—Chondroma of upper end of humerus. P.A.

PLATE 26.



Fig. 1.—Chondroma of os calcis. P.A.



Fig. 2.—Enchondromata of phalanges of hand. P. A.



Fig. 3.—Multiple osteomata. P. A.



Fig. 4.—Ivory osteoma of skull.

PLATE 27.



Fig. 1.—Angioma of the scalp. P.A.



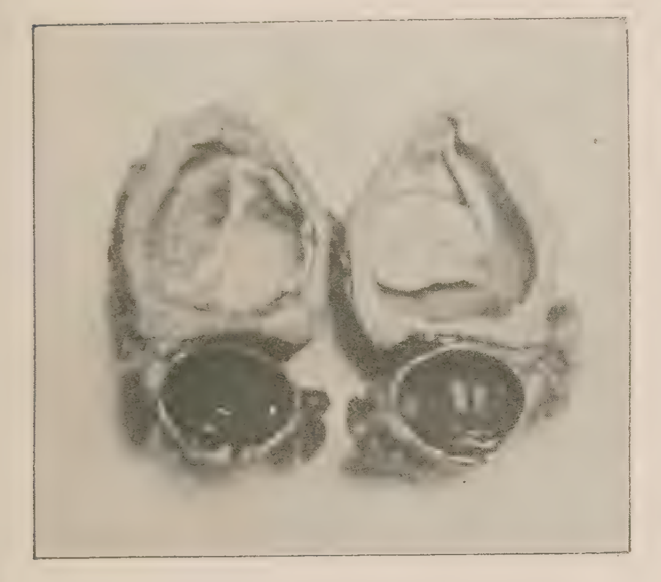


Fig. 2.—Post-orbital hydatid cyst. P.A.

Fig. 3.—Naevo-lipoma of lower limb.



Fig. 4.—Soft fibro-myoma of uterus, weighing, after sub-total hysterectomy, 18 kilos (53 lbs). Believed to be nearly a record weight. P. A.

IX. CYSTS.

There is very little essentially Egyptian to add to our knowledge of cysts in general. We have very few dermoids, rather more than our share of cysts in connection with the remains of the thyroglossal duct and ranula, and large numbers of ovarian cysts, often of alarming proportions. For the rest, the incidence of cysts corresponds closely with that of European countries and they are treated on the usual lines.

HYDATID CYSTS are uncommon but have a peculiar habit of appearing in unusual situations. They are found, for instance, behind the eyeball, in the thyroid, in the broad ligament, and in the brain. They occur, however, only in isolated instances, even in the liver and spleen. In fact, hydatid cyst always excites the keenest interest on account of its rarity. The village dogs are usually very wild and are very rarely the subject of hydatid disease; though it is interesting to note that our last two cases of hydatid cyst of the liver came from Armant, which is famous throughout Egypt both for the quality and quantity of its dogs.

Each case must be treated on its merits and we have nothing novel to record in the way of operation for hydatid. To be quite candid the diagnosis is very often made at the operation.

X. THE SURGERY OF WOUNDS, ACCIDENTAL AND OPERATIVE.

The first duty of every practical surgeon is to make himself thoroughly familiar with the tools of his craft: and to learn to apply for his own benefit all the various mechanical and chemical aids designed to render his methods as perfect as possible. The practical application of all these different measures is included in the expression 'THE PRINCIPLES AND PRACTICE OF ASEPTIC AND ANTISEPTIC SURGERY, to which subject we must now refer in considerable detail.

Our knowledge of the universal distribution of possible harmful micro-organisms obliges us to start with the assumption that everything is—surgically—dirty that has not been rendered sterile—or surgically clean. This broad indictment applies to the hands and person of the surgeon, his assistants and nurses, the patient generally and locally, —at the operation area—the dressings, the lotions, the swabs, and everything that may possibly come in contact with the area of operation.

We have then to consider the means at our disposal that will ensure us a surgically clean operation; and I propose to describe the measures we are accustomed to take at Kasr-el-Ainy hospital and, at the same time, to indicate alternative methods that may be followed in private practice, when everything has to be prepared at the patient's house, by the surgeon himself or his assistants.

The construction and arrangement of the operating theatre must be studied by actual observation and practice; and in private the room in which the operation is done must be made as much like a theatre as possible. A large airy room should be chosen with plenty of light, and the carpets and curtains removed. The floor may be scrubbed but dusting of the room should not be done. The floor should be covered under and around the operating table with a clean sheet or sheets and a mackintosh placed under the sheets.

LOTIONS AND THEIR PREPARATION. All vessels in which water or lotions of any kind are put must be sterilized in a special box or linen bag which is placed in a steam sterilizer; or by boiling in a boiler, or in a large clean metal or enamel cooking vessel, (such as the family "hallah" حلة) and then placed in a 1 % solution of lysol or cyllin. Or, they may be 'flamed' by allowing alcohol to burn in them and subsequently cooled. Glass vessels should first be placed in warm water before being boiled or they are liable to crack. Bowls, dishes, basins etc. prepared in any of these ways may be used directly from the box or bag in which they have been sterilized or may be kept in a 1 % lysol or cyllin solution till required. If they are likely to come in contact with the patient or any part of the sterilized field of operation they must be covered with a sterilized towel.

In *private* these articles should be left in the water or lotion in which they have been boiled and used directly from it, the vessel being kept covered by a lid or a clean newly-washed cloth or towel.

Sterilized water is obtained from a special water sterilizer, in which the water has been thoroughly boiled for 20 — 30 minutes and then cooled by circulating cold water through a spiral tube within the water reservoir. It is withdrawn at the required temperature, as indicated by the thermometer attached to the sterilizer, from a tap into a sterilized jug, or other vessel, which is kept covered.

Small quantities of water may be sterilized by boiling in a glass flask. The neck of the flask is then plugged with sterilized wool and set aside to cool.

In *private*, water may be simply well boiled in a clean metal vessel, kept covered and allowed to cool ; and then be taken directly from the vessel, by means of a boiled dipper or cup, and put into a boiled or sterilized jug, bowl, or basin.

Normal saline solution is prepared by adding a teaspoonful of sodium chloride to a pint of water - 6.5 grammes to the litre—and may be then sterilized in a special sterilizer. It is often prepared in a concentrated solution by boiling it in a glass flask, the neck of which is then plugged with sterilized wool. The necessary dilution to give us a *normal* saline solution is made by the addition of boiled or sterilized water in appropriate quantities.

In *private*, the solution may be prepared by adding common salt to the water in the proper proportions and the solution boiled. It is then filtered and the filtrate again boiled. Great care must be taken to ensure the sterilization of normal saline solution, and it must be freshly prepared for each operation in private, or each day in hospital practice.

Stronger solutions of saline solution are sometimes required and they must be prepared and sterilized in the same way. 5 % or 10 % solutions are most commonly used.

All *antiseptic lotions* must be made with boiled or sterilized water, with sterilized materials, and in sterilized vessels ; and be kept under sterilized conditions throughout. They must be frequently changed if they have to be used from uncovered vessels during the operation.

In actual practice, apart from sterilized water and normal saline solution, we use very few lotions. A 1/2 -1 % solution of *lysol* or of *cyllin* ; *biniodide of mercury*, 1 in 1000 with sterilized water, or with 500 parts each of alcohol (70 %) and water ; 70 % *alcohol*, and *carbolic* acid, 1 in 40 of sterilized water,—for instruments, ligatures or sutures, or for soaking double cyanide gauze in for dressings—represent our sum total.

Iodine is largely used for the preparation of the operation area in strengths of from 2 1/2 —5 % in rectified spirit; and the weaker solution is sometimes diluted 1-200 for irrigating abscess or uterine cavities.

STERILIZATION OF TOWELS, SHEETS, DRESSINGS, GAUZE, WOOL AND BANDAGES. All these articles are sterilized by steam in a special sterilizer, of which two forms are in common use. The various articles are packed in tin boxes inside a lint lining, and the slots in the

boxes are left open. The filled tins are placed in the sterilizer which is firmly closed. With the *low-pressure* sterilizer, which is heated by a large paraffin lamp, or gas, the temperature, as indicated by the thermometer attached, is raised to 100° C. (212° F.) and kept steadily at that temperature for half an hour. The lamp is then removed, or the gas turned off, the lid of the sterilizer opened and the tins allowed to cool, when they are removed, the slots being carefully closed in doing so. In the *high pressure* sterilizer the same procedure is followed and a pressure of 10 atmospheres is reached and maintained for 20-30 minutes, when sterilization will be complete.

It is customary to pack one tin with towels and sheets ; another with aprons, sleeves, caps and masks ; another with dressings and bandages; and yet another smaller one with gauze swabs. For abdominal work, a tin of much larger, abdominal, gauze swabs is required.

Our dressings consist of large square pieces of gamgee tissue about 30 c.m. square. The swabs are entirely of gauze, the size of a small handkerchief, 40 c.m. x 20 c.m., with all the edges folded in. The abdominal pads are of gauze also, the size of a small hand towel, 90 c.m. x 55 c.m., and loosely folded. Pieces of cyanide gauze of the same size as the small gauze swabs are also sterilized with the dressings, after having been soaked for an hour in 1-40 carbolic ; and also large pieces of wool, and several sizes of gauze bandages.

In *private*, towels and sheets can be boiled, and gauze or wool sponges also, after wrapping them in a small towel or piece of gauze, and all used wet, after wringing or squeezing them out in a boiled towel. Antiseptic dressings of clean cyanide gauze, soaked in 1 % lysol or cyllin, or in 1-40 carbolic, may be applied instead of sterilized dressings, or ordinary white gauze can be boiled and applied wet, after being wrung out like the swabs. It may not be possible to sterilize gowns or aprons in private, in which case they must be used fresh from the wash. Great care must be taken not to touch any part of the sterilized field with them. They may also be boiled, wrung out, and worn wet over a mackintosh gown or apron.

Mackintosh sheets and aprons must be thoroughly cleaned and washed with lysol lotion before use. Jaconet and some kinds of mackintosh can be sterilized in the box with the linen gowns and aprons.

STERILIZATION OF INSTRUMENTS. All blunt metal instruments, rubber catheters, glass and rubber drainage tubes, irrigator nozzles, and tubes are boiled for twenty minutes in a 1 % sodium carbonate solution,or in 1 % lysol. It is not enough to put the instruments in and boil them up for twenty minutes : the water must be actually vigorously boiling for this time and all the instruments must be well covered with water.

The instruments are then removed in the tray of the sterilizer and placed with sterilized forceps or gloved—sterilized—hands on to tables, which have been sterilized with alcohol and covered with dry sterilized towels. Sometimes they are placed in shallow trays, sterilized and filled with carbolic 1-40, or 1 % lysol or cyllin. They are kept covered with a

dry sterilized towel till they are actually used and those not in use carefully covered throughout the operation. If an instrument is soiled with blood during the operation it is cleansed in sterilized water or, preferably, boiled up again in the sterilizer. If it should touch anything unsterilized or become soiled with pus, it should be boiled again in the sterilizer or, preferably, put aside and not be used again for the operation.

Knives and delicate cutting instruments may be soaked in alcohol (70 %) for a quarter of an hour; or, they may be boiled for a few minutes, well wrapped in wool or gauze (separately from the rest of the instruments), or in a special rack. They are then put into alcohol and used from it.

Needles are treated like knives and after boiling are placed in pure lysol in shallow glass-dishes—Petri's dishes—and then rinsed in alcohol before threading.

In *private* there is no difficulty about boiling all the instruments in a towel and using them off the wet towel on a properly sterilized table, or from trays containing antiseptic lotions.

OIL may be sterilized by placing the bottle containing it into a saucepan of warm water, which is then boiled for half an hour and the oil allowed to cool. VASELINE may be sterilized in exactly the same way, then allowed to cool and set again.

IODOFORM EMULSION WITH GLYCERINE may be required during the operation and may be sterilized as follows:—

Put 10.0 of iodoform in a small glass vessel and cover it well with 1-20 carbolic and let it stand overnight. In the morning take 100.0 of glycerine in a beaker and sterilize the glycerine as you do oil. Pour off the carbolic from the iodoform and add the sterilized glycerine, after it has cooled, and mix well with a sterilized glass rod and vigorous shaking, and keep in a sterilized bottle till required.

GLOVES are boiled with the instruments for ten minutes, in a separate linen bag or perforated metal box. They are then turned out into sterilized water, lysol or cyllin lotion, and go on quite easily if well filled with this fluid.

GUM-ELASTIC CATHETERS are placed in a long covered glass jar and sterilized in the vapour given off from tablets of formaline.

THE PREPARATION AND STERILIZATION OF LIGATURES AND SUTURES.

SILK is lightly rolled on reels or glass rods, sterilized with the dressings in the steam sterilizer, then boiled for one hour in water, and kept in 1-40 carbolic. It may be again boiled for ten minutes before use, and used just as it is without any further soaking in any lotion. It is boiled again after the operation and put back into carbolic lotion.

LINEN THREAD is prepared in the same way; but if *black* thread is used very prolonged boiling is necessary to get rid of the dye.

SILK-WORM GUT is boiled for an hour and kept in 1-40 carbolic, and used from that lotion, or boiled again with the instruments.

HORSEHAIR is now almost entirely replaced by fine silk-worm gut and is prepared in the same way.

SILVER WIRE or ALUMINIUM BRONZE WIRE is boiled with the instruments.

CATGUT is lightly rolled on glass rods and sterilized as follows :—

Make first a solution consisting of iodine 10.0 ; iodide of potassium 20.0 ; water 100.0. Take 10.0 of this solution and add 30.0 of distilled water and 60.0 of rectified spirit. The catgut is put in this second solution and left in it for eight days. It is then taken out and rinsed in sterilized water or in 1-40 carbolic.

It is now put in 3 % formaline for 24-36 hours, depending on the thickness of the catgut, and then allowed to soak in sterilized water for a few hours, to remove the excess of the formaline ; and finally placed in a mixture of absolute alcohol 50.0 ; iodine 5.0 ; glycerine 50.0. It is now ready but should be rinsed in sterilized water before using.

This makes a very strong and safe catgut, but it is almost too permanent for skin edges. To make an earlier absorbed catgut, the process may be stopped before the formaline stage ; and the catgut put into a solution of 1.0 of iodine in 50.0 each of 70 % alcohol and sterilized water, from which it is used.

Ligatures and sutures must be very carefully kept sterilized. They should have as little handling as possible, as they are such potential sources of infection. They should be handled only with sterilized forceps and scissors till they reach the surgeon's hands and not allowed to touch anything at all in transit.

PREPARATION OF THE PATIENT FOR OPERATION.— The patient must be prepared on general principles and have his bowels well opened ; usually by a dose of castor oil—30.0—the night before, and a large soap and water enema, repeated if necessary, in the morning. No food must be given for at least four hours before operation, but milk or beef tea may be given then and, if necessary, a rectal saline enema of 300.0. an hour before operation. To this in bad cases 25.0 of brandy may be added.

This is really the preparation necessary for all cases requiring an anaesthetic ; and will be further described under the section on general anaesthesia.

Locally, the patient must have the whole operation area shaved and then take a hot bath and use soap plentifully. An hour after the bath, the part is well rubbed with alcohol (70%) and then painted widely all round with iodine, 2½% in rectified spirit. He is then allowed to sleep in a clean night shirt and, in the early morning, the part is again painted with iodine.

Special operations require very elaborate preparation but the majority of clean operations are prepared as above.

If there is a wound or a discharging sore, this must be dressed with saline or eusol fomentations and the surrounding area painted with iodine.

If iodine is not available, the whole operation area, and well beyond it, must be thoroughly washed with *alcohol-soap* and boiled water. This soap is made by boiling one part of green soft soap in two parts of water; and, after cooling, three parts of alcohol (70%) are added and all mixed well together. After a good rubbing with this soap with the hand, the part is cleansed with boiled water and a large lysol fomentation (1°/o) applied and left on all night.

LOCAL, SPINAL, AND GENERAL ANAESTHESIA. In practically every case of operation the part or the patient is anaesthetised; and we must now give a very brief summary of these processes to complete our account of the progressive stages of an aseptic operation.

Only the methods we regularly employ will be described, without prejudice to others probably equally as good.

LOCAL ANAESTHESIA is induced by the injection of a 1°/o solution of *cocaine* in sterilized water. Ampoules of 1°/o solution may be procurable. In hospital cachets of cocaine, containing 0.30 of cocaine, are kept and one is added to 30.0 of warm sterilized water in a sterile glass and at once dissolves. The hypodermic syringe and needle are boiled and everything in connection with the injection is done absolutely aseptically. The skin of the patient is prepared with iodine and the operator's hands and aseptic technique must be above reproach. The injection must be made in the line of the projected incision, first actually into the skin itself till it leaves a continuous line of cocaine vesicles within it. Then the deeper tissues are injected in the same line in turn; and, finally, the subcutaneous tissues all round the area of the proposed incision. There is very little if any risk of cocaine poisoning when using this solution freely and the operation may be begun at once, as soon as the final preparations are made. In the course of the operation more of the solution may be injected into the various layers if sensation is not entirely abolished.

Quite extensive operations may be done with local anaesthesia employed in this way; and it is particularly useful when the patient is very ill, or, for any reason, cannot be given a general anaesthetic, or only to a very light degree. For instance, in a desperate case of empyema thoracis, the whole operation can be done by this method, a few whiffs of chloroform being given just as the rib is being divided. This distracts the patient's attention and the pain from a clean rapid cutting of the rib is quite momentary. Similarly, the greater part of the operation on an acute abdomen can be done by this method; and it has many other applications.

Quinine and urea hydrochloride in 1°/o solution may be used in precisely the same way as cocaine. It is put up in ampoules, which is very convenient, and it has the advantage of retaining its anaesthetic action for several hours after the operation, often as long as 48 hours if much of the solution has been given. It is used warm in exactly the same way as the cocaine solution.

The use of these injections and others of the same kind in the operations by ANOCI-ASSOCIATION (Crile) must be studied elsewhere. We have not had sufficient experience in the method to make our comments on it of any value.

The topical applications of stronger solutions of cocaine to the skin or mucous membranes, and the external use of ethyl chloride, ether, and other freezing agents, as means of inducing local anaesthesia, need not detain us, as their indications and applications are quite obvious.

The infiltration method by the use of *weak saline solutions*, with adrenaline and eucaine, has been completely superseded with us by the dilute cocaine solution first mentioned.

THE PREPARATION OF THE PATIENT FOR GENERAL ANAESTHESIA. However trivial the operation the patient must be properly prepared before a general anaesthetic is given. If the operation is timed for 9 a.m., castor oil, or other efficient purgative, must be given in full doses the night before and a soap and water enema early on the morning of the operation. These strong purgative measures can only be taken if the general condition of the patient permits. At 5 a.m. a cup of milk or beef-tea is given and nothing after that time, that is for a clear four hours before operation. Feeble and collapsed cases may be given a rectal saline injection, 300.0 containing 25.0 of brandy, at 8 a.m. In very bad cases arrangements are made to give saline subcutaneously, or by vein, on the table while the operation is proceeding.

The action of the anaesthetic, especially chloroform, is assisted by a *preliminary injection*, half to a quarter of an hour before operation, of morphine 0.01 (1/6 grain) atropine 0.00065 (1/100 grain) or scopolamine (which consists of morphia 0.01, hyoscine hydrobromide 0.00065 and atropine 0.00036). Sometimes the morphine and the atropine are given together.

The actual giving of the anaesthetic can only be learnt by instruction and experience; but there are certain practical points to which attention must be directed.

THE ADMINISTRATION OF CHLOROFORM.—The most usual general anaesthetic throughout Egypt is *chloroform*. This must be reasonably fresh and be kept carefully in a coloured bottle in a dark cool place. This is especially necessary in the hot weather. Very serious and even fatal cases of poisoning sometimes occur from the use of chloroform which has undergone this dangerous decomposition. Even with the freshest chloroform a mixture of air containing more than 4 % of chloroform produces poisonous effects. Chloroform must therefore always be given slowly, if not quite drop by drop, certainly in small quantities at a time; and the patient allowed to have plenty of air during the inhalation. Care must be taken also when struggling occurs, and an increased quantity of chloroform is indicated, not to allow too much to be inhaled during the greatly deepened inspiration caused by the struggling. In most cases, after the struggling stage has passed, preparations for the operation may be begun and the operation actually started when the patient is lightly under, more anaesthetic being given, if anaesthesia is not complete, as necessary. Once he is really under, very little chloroform is required to keep him under, and the mask may be removed entirely for a minute or two from time to time. The anaesthetist has only to watch the respiratory

movements at the mouth or chest, and to examine an accessible pulse, such as the temporal or facial, from time to time, to assure himself of the satisfactory condition of the patient; and he must not withdraw his attention from the anaesthetic, and interest himself in the actual operation, or disaster is bound to result sooner or later.

During the anaesthesia *vomiting* or *retching* may occur and is best managed by hooking the fingers under the lower jaw and pulling it well upwards and forwards, continuing and even pushing the chloroform at the same time. This manoeuvre pulls up the base of the tongue and generally renders the catching of the tongue with forceps unnecessary. (It is the mark of a bad anaesthetist in most cases to have forceps attached to the tongue). The patient's head is pushed to the side and the mucus or other vomited matters carefully cleared from the mouth. A wooden wedge-gag may be inserted between the teeth with great benefit. Nothing more disturbs the operator, especially if the operation is for hernia or an abdominal condition, than vomiting; and often, by watching carefully for threatening of retching, vomiting may be stopped by a judicious pushing of the chloroform and the pulling upwards and forwards of the jaw. If the patient has not been properly prepared, vomited matters may prove a great danger, as they may be aspirated into the larynx and threaten to produce suffocation. The tongue must then be drawn forward, after a gag has been inserted, and the throat thoroughly cleared.

If the *breathing becomes shallow* and shallower, this must be spotted at once, the mask taken off, the jaw well pulled up and forward, and a squeeze or two of the lateral chest walls made, if the operation permits. Immediate warning must be given to the operator and, unless the breathing improves very rapidly, the operation must be stopped, the tongue caught with sharp rat-toothed forceps transversely at the tip—not antero-posteriorly—the jaw held forwards, and artificial respiration started and persisted in till such time as the breathing returns or distinctly improves, when, if the pulse has improved in like proportion, the operation may be resumed. This shallow breathing may mean that the patient is about to retch or vomit, and improvement at once follows when this occurs; but recourse must be had to artificial respiration, and other more vigorous methods to be described later, if the breathing does not re-start or improve in spite of the act of vomiting.

The two great dangers of chloroform are *failure of respiration* and *heart failure.* The indications of these dangers are, in order, a gradual weakening of the breathing, a bad bluey-white or dull pallid colour of the face and skin surface generally, and an increasing feebleness of the pulse. In actual practice these two dangerous conditions occur almost simultaneously and have to be treated together. At the very first sign of danger, the mouth is opened and kept open with a gag, the tongue is secured with forceps, or a silk thread, and kept well pulled up and out of the way, the jaw is pulled up and held well forward, and artificial respiration commenced and continued till breathing begins once more, and promises to continue.

At the same time, five minims of a 1 % solution of strychnine is injected hypodermically and, if no response is quickly forthcoming, adrenaline or, better, pituitrine—$\frac{1}{2}$ c. c. ampoule — is given also. As a

last resource, ether, spartaeine and camphor may also be injected; and inhalations of oxygen gas given whenever this is available. Hot cloths are placed over the cardiac area and constantly renewed, and hot normal saline injected intra-venously.

All the time the artificial respiration is going on, if it is possible, and especially in children, the patient may be completely inverted, held up by the feet with the head hanging down, and rhythmical tuggings made at the tongue, or of the epiglottis, with the finger in the mouth, thus jerking the base of the tongue and sometimes re-starting the breathing.

Should all these measures fail to recover the patient one must not hesitate to open the abdomen, by an oblique incision below the margin of the ribs on the left side, insert the hand and make regular compression and massage of the heart through the diaphragm. Only if the respiratory failure is definitely due to the entry of vomited matters into the larynx is tracheotomy of any use, but in the case we have been discussing it is generally much too late to be of any service, as cardiac failure has also already occurred.

For cases in which a sudden and primary heart failure supervenes in the early stage of chloroform anaesthesia, the *status lymphaticus*, which is often associated with a much enlarged thymus, is generally responsible, and no kind of treatment is of any avail. Only the most careful medical examination of the patient before operation will discover this condition; and too often it is entirely missed and only discovered at the autopsy of a death under chloroform.

Reference must be made to special text-books for details of the routine *after-effects* of chloroform, such as repeated vomiting, collapse etc., but I wish to draw particular attention to the symptoms of *delayed chloroform poisoning*, of which I have seen several examples during the last few years. The commonest cases are those which develop an acidosis, with scanty urine, which is highly concentrated, not necessarily albuminous, and smells strongly of acetone. Exactly the same odour is noticed in the breath. These symptoms do not occur till two or three days after the operation, and may be preceded by a persistent vomiting which nothing will control. The patient apparently comes out of the chloroform quite well, but the next day is sleepy and, though he can be roused and talks, he remains drowsy and heavy and soon refuses to answer questions or take any notice of his surroundings. One always feels that he is playing with you and you want to smack him and tell him to wake up and not be a fool. When you find a patient like this after an anaesthetic you must be on your guard at once and act very vigorously. Soon he lapses into a semi-conscious state, but may wake up and become very restless and excited and sometimes quite violent, or he may have a series of convulsions which usher in the end. Other cases may gradually lapse into complete unconsciousness very like a person with diabetic coma. I have also seen a similar fatal result after an operation for the removal of the gall bladder: but here the vomiting came on and persisted with terrible intensity, and became practically continuous, the patient emaciated extraordina-

rily rapidly, became deeply jaundiced, and died of sheer exhaustion and all the severest symptoms of intense cholaemia, very like the final stages of an acute yellow atrophy of the liver. When the urine contains much albumen at the time of the operation, death may occur from uraemia, without any acidosis, and is then usually preceded by severe convulsions.

Prophylactic treatment, by the administration of sugar or lactose and sodium bicarbonate before operation, is indicated ; but treatment, once the condition has become established, in my experience, is most disappointing and follows that for diabetic coma and acidosis in general. It consists in the plentiful administration of sodium bicarbonate by the veins and by every other possible channel. For the rest, washing out the stomach with bicarbonate of soda solution, stimulants in every form, champagne particularly, rectal saline injections with brandy, strychnine, camphor, spartaeine hypodermically, are all indicated and must be pushed to the utmost limit of safety. Nearly all cases of this insidious and often quite unrecognised condition die within four or five days of the operation.

Chloroform is therefore a danger in all cases of albuminuria and in prolonged operations on the liver or gall-bladder ; and perhaps more than ever in suppurative conditions within the abdominal cavity. It should especially be avoided in appendicitis with abscess or in general peritonitis from any cause. Partly for this reason, but also for its marked depressant effect, it is to be avoided in all cases of acute abdomen, especially at an advanced stage when collapse has become a prominent feature. In all such cases it is best to give your patient an absolute minimum of chloroform to start the anaesthesia and then to continue throughout with open ether ; or, better still, whenever it is at all possible, spinal anaesthesia should be adopted, in modified dose, with a small quantity of chloroform or ether by inhalation if the anaesthesia is not absolute or high enough.

In operations about the *mouth or throat* chloroform is well given by a Junker's inhaler, the tube being passed into the nostril, or mouth, or even into the tracheotomy tube, if this operation has been performed as part of the operation. Considerable practice is required to attain proficiency in this method.

Very good and safe anaesthesia may be obtained by using the *apparatus of Richard*, in which a very large admixture with air is effected, and only a fractional dose of chloroform vapour is inhaled. This apparatus appears to have been the original type from which the Vernon-Harcourt and other inhalers of the kind have been adapted.

Chloroform properly given and in the smallest quantity possible is the anaesthetic *par excellence* for children, but I must add a word of warning in its use for circumcision in young children. When the prepuce is cut, there is often serious, if not dangerous, collapse, and as light a degree of anaesthesia as is possible must be the anaesthetist's aim.

ETHER is the safest of general anaesthetics but is not very much used in Egypt, mainly because of its very rapid evaporation. We use it

entirely by the open method and it is best given on a mask consisting of several thicknesses of lint, to prevent, to some extent, excessive evaporation. It is rarely used entirely by itself, but generally after the patient has been partially anaesthetised with chloroform; as, for instance, in cases of acute abdomen, especially when there is any suppuration or peritonitis. It has the advantage, too, that abdominal cases can be sat up almost immediately after the operation when ether has been given; whereas the recovery from chloroform—quite apart from the risk of only partial recovery—takes a considerable time, which may prevent the early adoption of stimulant measures which may be of vital importance to the recovery of the patient. The after-effects of ether are trivial in comparison, though the smell of the anaesthetic is much more persistent than chloroform.

Were we able to procure regular and fresh supplies of OXYGEN or ETHYL CHLORIDE, ether would be much more used to supplement these drugs; but as it is, we must depend on our chloroform for the first stage of anaesthesia.

SOMNOFORM anaesthesia is very frequently used in hospital practice for minor operations of all kinds and is most useful. The opening of abscesses or whitlows, passing of catheters, puncture of distended bladders, and all the many out-patient operations and manoeuvres are dealt with under somnoform. A very short experience suffices to master the manipulation of the apparatus, and so temporary is the anaesthesia that no bad results have ever been recorded.

SPINAL ANAESTHESIA WITH STOVAINE. We have been using spinal anaesthesia with stovaine in Kasr-el-Ainy for some years; and it is my intention to describe our technique in detail, and to give the conclusions we have arrived at with regard to this form of anaesthesia.

The patient is prepared for spinal anaesthesia in exactly the same way as for general anaesthesia; and to receive his dose is sat up on a firm table, with his legs hanging over the side, and his back arched as strongly as possible backwards by pressing his head down on to his chest. His elbows are bent and placed on the inner borders of the corresponding thighs. In this way the whole spinal column is made to form a strongly convex curve backwards, the intervertebral spaces are opened to their fullest extent, and the injection is so much more satisfactorily and easily done. Many cases of failure are due to insufficient attention to placing and maintaining the patients in the proper position.

When the patient cannot be sat up, he is placed on his side and made to curl himself up as firmly as possible, so as to render the back convex backwards as before.

The lower part of the dorsal, and the lumbar and sacral regions are now painted with iodine, and the highest points of the crests of the ilium defined. A line joining these two points across the back crosses the

middle of the spine of the fourth lumbar vertebra. The injection may be made in any space below the first lumbar vertebra ; and is most often given in that between the third and fourth.

I prefer a strong needle, like a small exploring needle, and introduce it without a stilette exactly in the middle line, and directed rather upwards to get well in between the bones. The only certain proof of proper entry into the cerebro-spinal space is the flow through the needle of clear fluid, which comes out, sometimes drop by drop, or in a full steady stream under quite considerable pressure. If you are sure the needle is properly placed and still no fluid flows, it may come after the needle is twisted round, but if not the stilette may be introduced to clear the track.

It is better to remove the needle altogether and try a higher space, than to persist in searching for the right track with the point still buried, after two or three failures in different directions. When the flow is satisfactory the syringe, already charged with the stovaine solution and cleared of air, is fitted on. The cerebro-spinal fluid then flows in by its own pressure and dilutes the solution by half or even more. This mixture is then slowly injected and an attempt made to draw it back again from the theca into the syringe. This is again injected, and then the needle, with the syringe still attached, is withdrawn; and the patient placed in the semi-recumbent position with the head and shoulders well raised on a special pillow. It is very important to screen off the operation area from the view of the patient before any preparations are made for beginning the operation.

If the cerebro-spinal fluid cannot be drawn into the syringe by gently pulling the piston out, the stovaine solution may be injected at once, without admixture, and the anaesthesia *may* be just as perfect as when it is freely mixed with the cerebro - spinal fluid, but it is much more uncertain in its action. Failure to enter the canal may occur in old men who cannot bend their backs properly and in whom there may be some bone condition, like osteo-arthritis, which occludes the already small intervertebral spaces. In most cases, however, failure is due to faulty position of the patient.

We have had a long and very satisfactory experience with the *formula of Billon*, but have recently been making our own stovaine solution in the hospital pharmacy according to Billon's formula, but without the adrenaline. The original formula is stovaine 0.08, epirenine borate 0.0026, sodium chloride 0.0022 and water to 2.00: 1.5-2c.c. of this strength is the usual adult dose, but a smaller quantity is sufficient for operations about the rectum, perinaeum, or bladder. The dose must also be reduced for small people and children. The syringe and needles must be boiled in *plain* water and not in a bicarbonate of soda solution, or the stovaine is decomposed, and the ampoules must be made of Jena glass.

"We are now using a solution prepared in the School, under the supervision of Dr. Bahry Bey. The formula is :- Sodium chloride 0.0011; stovaine 0.04; water 1 c. cm. It is prepared as follows :- The sodium chloride is dissolved in the water and the solution sterilized in the autoclave for 15 minutes and left to cool. The stovaine is then dissolved in the solution and filtered through a good filter previously sterilized. It is then heated in a water-bath for ten minutes at 80° - 90°C.

After cooling it is stored in sterilized ampoules. Strict asepsis is observed throughout but this solution must not be boiled or the stovaine will decompose and the preparation be rendered inert." Refer to paper on 'The Routine Use of Spinal Anaesthesia in Gynaecology, a study of 1552 consecutive cases', by Dr. Naguib Mahfooz Bey in the Lancet of August 3rd, 1918.

Excluding cases in which a satisfactory injection has not been given about ten per cent of cases give an unsatisfactory anaesthesia. Generally a very small amount of chloroform is then sufficient to produce anaesthesia, and only rarely has one to continue with the chloroform to the end of the operation.

Many cases have no *bad effects* whatever during the time of the operation; but a few have symptoms of mild collapse with pallor, yawning, retching, faintness, nausea and a feeble pulse. These symptoms often rapidly pass on giving a drink of water or brandy, or after the patient has vomited. Rarely, however, they get worse and the patient is deathly-white in colour, lips and all, his breathing becomes very shallow and sighing, and he is obviously in a state of profound collapse, with air hunger and respiratory and cardiac depression; and strychnine, pituitrine, camphor and artificial respiration are urgently necessary. Most cases fortunately recover, especially after artificial respiration, but a fatal result does, very rarely, occur in fat persons, with marked arterio-sclerosis or Bright's disease, and even when such cases do not actually die their condition is often very alarming. Once they start to come round their improvement is very rapid and they are soon quite all right.

As our experience has increased we have very few after-effects; sometimes there is backache, or headache, for 24-48 hours, and fever, and possibly retention of urine, but no permanent after-effects have been seen. Aspirine, pyramidon, phenacetin and caffeine are given, for such symptoms and in severe headache, lumbar puncture is done and repeated if necessary.

The anaesthesia lasts on an average an hour and a half. After that time chloroform may be required to complete the operation.

Practically any operation below the costal margins may be done with spinal anaesthesia. It is possible, though very unwise, to endeavour to produce a higher level of anaesthesia. After an experience of eleven cases of *cervical* spinal anaesthesia I decided that this procedure was altogether too dangerous to continue, though I had no fatalities in the series.

GENERAL CONCLUSIONS REGARDING THE USE OF SPINAL ANAESTHESIA.

After a lengthy experience of stovaine we find we have almost unconsciously come to use it in all the routine operations below the umbilicus, with certain exceptions which will be referred to later. Thus, many of our stock operations, inguinal herniae, and often, also, umbilical hernia and hernia in the linea alba, all operations about the scrotum, perinaeum, bladder, urethra and rectum, and practically all operations on the lower extremity, are naturally done with stovaine.

Appendicitis and acute abdomen generally may be done with stovaine also, with care and selection ; but on the principle that one never knows where an abdominal operation will lead to, I prefer a slight preliminary chloroform followed by ether whenever possible. When collapse is marked and peritonitis general, a reduced dose of stovaine may be given ; but it is uncertain in its effects and, moreover, the greater part of such desperate operations can be quite well done with local anaesthesia. The muscular relaxation, both of voluntary and involuntary fibres is very complete with stovaine, and this of itself may be a great advantage, especially in the lower abdomen and about the rectum and anus.

We can generally do an umbilical hernia quite satisfactorily with stovaine ; but have sometimes to supplement it with chloroform, especially when much omentum is present in the sac, and its separation entails dragging on the transverse colon or stomach in the upper part of the abdomen. We even find that, with an otherwise perfect stovaine, the dragging on the peritoneum at the neck of an inguinal hernia sac causes pain. In this operation, too, it is remarkable that the suturing of the muscle may be the sensitive part of the procedure.

By introducing the stovaine high up in the lumbar region, or even in the lower dorsal spaces, it is possible to excise a rib for liver abscess ; but this is only done with stovaine when there is much respiratory distress or broncho-pneumonia.

In vesical stone operations and all other operations on the bladder, it is perfect ; but, in anything but a low drainage of a hydro-or pyo-nephrosis, we do not rely on it for kidney operations, but resort to chloroform or ether, which may be also rendered necessary by the position the patient is made to assume during the operation.

Stovaine also has its limitations on anatomical and pathological grounds. Thus, it should not be given for the evacuation of a psoas abscess or for an iliac abscess due to tuberculous disease of the spine ; and, in many of our cases of girdle tuberculosis with necrosis, it must only be given with caution and discretion.

Stovaine for the relief of shock in severe injuries in the lower abdomen, pelvis and lower extremities, and in the setting of fractures and in other operative procedures necessitated by the injury, is very valuable: as Thom, a former Resident Surgical Officer of the hospital, has pointed out in the Lancet of Oct. 1st 1910, and should be much more freely used in this way than heretofore. The pain is immediately relieved and the subsequent shock reduced almost to a minimum.

The most practical and instructive paper on the subject of spinal anaesthesia by stovaine is that of a *Study of five hundred consecutive cases* in our hospital by my colleague Owen Richards, in the British Medical Journal of Dec. 23rd 1911. This will repay careful study and I wish to epitomise some of the conclusions of that paper.

"A question which is often asked is whether spinal anaesthesia is 'better than chloroform'. Looked at it broadly it certainly is not. . . . The mere fact that chloroform produces, with certainty, an anaesthesia of the *whole* body puts it into a different category from an agent which produces, with a high degree of probability, an anaesthesia

of part of it. The question is whether, in cases in which both are available, spinal anaesthesia ever possesses advantages over chloroform, sufficient to make us prefer it. For certain operations, in the same way, we prefer cocaine, but no one suggests that this can replace chloroform, but we should be sorry to be without it.

"Spinal anaesthesia has its good points, a great many good points. It seems reasonably safe....its materials are portable and convenient, everything necessary for a dozen cases will go in a pocket. The after-effects may be vexatious but none of them, so far, have been very serious or lasting. The anaesthesia produced is fairly constant in its extent and of reasonably long duration. The technique is simple and uniform and does not demand the experience and judgment of a skilled anaesthetist for the whole period of the operation.....The dangers of stovaine are negligible, compared to those of a confident and inexperienced chloroformist, or to those of chloroform given fitfully by the operator or a layman. Another advantage is that patients can be fed any time up to, during, and after the operation. Old men with enlarged prostates were fed up to the time of their operation and given hot rum and milk immediately after it and did not suffer from shock.

"The muscular relaxation obtained from stovaine is more marked than with deep chloroform anaesthesia....Anal operations are rendered much easier and the sphincter requires scarcely any stretching....For setting fractures the difference between the two is less, but is still in favour of stovaine.....

"Its disadvantages are considerable. In the first place it is not absolutely trustworthy. Under the conditions described above there were over 10 % of part or complete failures ; and if it is necessary to have a chloroformist in waiting, in case the stovaine does not work, its chief advantage is gone.... Again the anaesthesia fails where it is necessary, as in abdominal work, to extend the operation higher than was anticipated.... The dosage cannot be easily varied in the course of an operation.... In order to reach the necessary level and full degree of anaesthesia, a dose must be given which will produce an effect lasting about an hour, even if the operation is going to be over in ten minutes. As a matter of fact, increased duration of the anaesthesia does not seem to involve any increased tax on the patient's strength. The patients fail, if they fail at all, at the beginning of the anaesthesia and, apart from the loss of blood, improve towards the end. Of course, an overdose of chloroform can be checked by stopping its administration, while an overdose of stovaine goes inevitably on. Giving chloroform is an art ; giving stovaine is a scientific experiment.

"The after-effects are not serious, neither producing damage to the operation wound or the patient, and are much less troublesome than those of chloroform."

After referring to the use of stovaine in special cases, and in shock, he concludes :

"To sum up, it is clear that spinal anaesthesia, owing to its limited field, can never replace chloroform. If we are to be limited to one method, that must, of course, be general anaesthesia. But in the ground common to both there is not a vast difference between the two methods, in ease, safety and effectiveness, if these are taken together over a large series of cases. What there is, is slightly in favour of general anaesthesia. Yet in a number of cases spinal anaesthesia offers advantages, which cannot be got in any other way, and its apparatus and technique are so simple, that it is worth any surgeon's while to use it, whenever there is anything definite to be gained by it. In the large number of cases, where there is nothing to choose between the methods, the use of stovaine becomes a matter of taste and convenience."

With much of the foregoing I am entirely in accord; but an increasing experience, and, especially, the knowledge of rather alarming accidents on patients, has made me to be more guarded in my opinion with regard to the universal employment of stovaine. And in an article, with which I supplemented my colleague's, in the British Medical Journal of August 17th 1912, I put the case for and against stovaine anaesthesia as follows:—

"In considering the case for stovaine one is naturally bound to compare it, for efficiency and safety, with chloroform anaesthesia and, in general terms, I think we must look on stovaine as a valuable alternative to ether or chloroform, in operations on certain definite areas, but as never destined to replace them. It is true that the accidents of stovaine are generally more alarming than dangerous; but, when they do occur, there is a dreadful feeling of helplessness, which is particularly perturbing. We have certain danger signals with chloroform, which are well-recognised and can be at once replied to, and the administration of the anaesthetic can be immediately discontinued; whereas, in stovaine the danger gives very little warning, if any, and the damage is done and cannot be undone, as the withdrawal of cerebro-spinal fluid, as recommended in such an emergency, is hardly practicable. It is true that only a very small proportion of cases give rise to the least anxiety; but a method must be judged by its possibilities of danger, when the question of a human life is concerned. Profound lowering of blood pressure, heart failure and air hunger are the more serious possibilities to be faced, and these can only be avoided by careful selection of cases, the proper grading of doses to suit individual patients, and the careful adoption and retention of appropriate positions, to prevent the dissemination of the drug beyond the limits of safety within the cerebro-spinal space surrounding the cord."

"Briefly, we have in stovaine a reliable anaesthetic for all operations below the costal margin; but one must not expect too much of it nor employ it without careful consideration, especially in cases where any form of general anaesthesia would be dangerous. Moreover, the fallacy that, after the injection is given and anaesthesia established, it is no longer necessary to trouble about the patient, must be once for all dismissed. Just as much care must be exercised in the administration of this potent drug, and in the management of the patient after injection, as with chloroform; and when this is done, the feeling of satisfaction after an extensive operation under this form of anaesthesia, when the stovaine has acted perfectly and the after-effects have been almost nil, must be experienced to be thoroughly appreciated.

PREPARATION OF THE SURGEON AND HIS ASSISTANTS. While the anaesthetic is being given the surgeon and his assistants, amongst whom are included the nurses and students, as well as the actual operative assistant, are busy making themselves surgically clean and robing themselves in the paraphernalia of their craft.

It is our custom for the *operator* to change entirely and wear a pair of white newly-washed duck trousers and to tuck them into large rubber boots. He then puts on a clean mackintosh apron and proceeds to scrub his hands and arms, as far as the elbows, with a boiled nail-brush and Sunlight, or other good soap, under running water. This water comes from the ordinary main water supply and some of it passes through a hot-water apparatus, but it is *not* sterilized. After scrubbing well till the muscles are tired, he dips the brush into a bowl of alcohol soap, the composition of which has already been mentioned, and scrubs up again

for another five or ten minutes, and washes off the soap under the running water. For a third time he scrubs up, with brush dipped in alcohol soap, in cyllin lotion—½ % — throws his brush into a saucepan, which is used for boiling the brushes, and then soaks his hands and arms in biniodide lotion, 1-1000 of sterilized water. He then puts on a sterilized gown, sterilized linen sleeves and sterilized linen cap, re-soaks his hands in the biniodide lotion, or in cyllin lotion, and puts on his gloves, which have been boiled and turned out into sterilized water, or lysol or cyllin lotion, tucking the bottoms of the sleeves into the wrists of the gloves. He is then ready for the operation and must be particularly careful not to touch anything unsterilized, either with his gloves or any part of his sterilized clothing.

The general preparation of his *assistant surgeon, nurses and students* follows the same lines; and his immediate assistant, or the student, after he has thoroughly scrubbed up as described above, and before he puts on his sterilized gown, prepares the part for operation, as will be described in a moment, and then re-scrubs his hands and robes himself like his chief. A gauze mask should also be worn for abdominal cases, but personally, I find them so hot and stuffy in our hot climate that it is only rarely I wear one, and do not know that my results suffer in consequence, with ordinary care. If either operator or assistant has any sign of nasal or other catarrh, masks are essential.

The operator, his assistant, and the theatre sister, who is in charge of the instruments, all wear gloves and all are equally responsible for the defence of the patient and his operation area from any outside unsterilized interference.

If gloves are not available, the hands are prepared as above, soaked in 70 % alcohol, and then dipped in a 1 % iodine solution.

THE LOCAL PREPARATION OF THE PATIENT ON THE OPERATING TABLE.

An attendant or nurse takes off the clothes and thoroughly exposes the whole area likely to be included in the field of operation. The assistant now rubs the whole area, and well beyond it, with iodine, 2½ % in rectified spirit, which is taken up with a sterilized swab of gauze. After the skin has been thoroughly well rubbed with the iodine, the assistant re-sterilizes his hands, and then (or the surgeon may do it for him) makes a complete field of sterilized towels all round, tucking them in under blankets or mackintoshes at the uttermost limits of the exposed area. A further set of towels is now fixed to the skin and to themselves with towel clips, which have been boiled with the instruments. The preparation is complete when nothing but a wide table-land of sterilized towels, or sheets, extends all round and completely hides the patient, the table, the mackintoshes, and the blankets, from view. A sterilized towel is placed on the anaesthetic screen also; and in operations about the mouth a sterilized mask is used, and the anaesthetist—who for purposes of the operation is numbered among the assistants—wears a pair of thick linen sterilized gloves.

The *nurse* in charge of the swabs and dressings, being herself properly prepared, is ready to hand them with sterilized forceps to the

assistant, from the box in which they have been sterilized, and which has been opened by an attendant's unsterilized hands, *not* by her sterilized ones; and a similar course is pursued when she has to hand abdominal swabs or dressings, or, in fact, anything sterilized to the operator.

The *theatre sister* has all her instruments fresh from the sterilizer, lying on a table, which has been flamed with alcohol and covered with a sterilized towel. She arranges them conveniently and then covers them with another sterilized towel, which she only lifts as she hands the operator or his assistant the instruments required. She touches no instrument with ungloved hands, and is particularly careful in cutting off pieces of ligatures or sutures not to handle them more than is absolutely necessary, and threads her needles with the same care. From time to time she may rinse an instrument in a bowl of sterilized water or hand over others to be again boiled in the sterilizer. Her duties are most important, and we have been particularly fortunate at Kasr-el-Ainy in having a series of excellent theatre sisters, whose work is a lesson in itself.

The main points in AN ASEPTIC OPERATION may be illustrated by our routine procedure for hernia, the steps of which are as follows :—

A free incision is made through the skin with a scalpel in the required position, generally above and parallel to Poupart's ligament, its centre lying almost over the external ring. Bleeding vessels are at once secured with artery forceps, and others divided between two forceps, until the incision is deepened to the aponeurosis in its whole extent. Large thick sterilized gauze pads are then clamped on to the cut edges of the skin by special forceps - Moynihan's - so that the rest of the operation is done entirely between sterilized gauze walls, without any skin surface showing anywhere. The aponeurosis is now incised in the line of the original skin incision, the long incision required being completed with a straight blunt-pointed scissors. In this way the external ring is completely bisected; and the lower flap of aponeurosis is cleared with the blunt end of the closed scissors until the whole of Poupart's and Gimbernat's ligaments are thoroughly defined, as part of the recurved insertion of the under surface of the aponeurosis. The cut edge of this flap is secured with an artery forceps. The upper aponeurotic flap is separated in the same way from the underlying internal oblique muscle, the cremaster and the conjoined tendon; and held up out of the way in the bite of an artery forceps.

The separation of the cremaster muscle and fascia from the spermatic cord, and the isolation of the sac from amidst its constituent parts, is then effected by blunt dissection and the free use of a gauze swab on a firm, but gentle, gloved finger. When the whole of the sac is clearly separated it is opened below to make sure no gut or omentum is within it ; and its neck is then transfixed with a curved round-bodied needle carrying a strong catgut ligature. A single thread is used and is firmly ligatured first on one side and then round the other half of the neck ; and includes the whole of it in a second loop and knot. Reef knots must be invariably tied and, especially with catgut, the ligature must not be cut too close to the knot. The sac below the ligature is now cut off and the stump slips well up out of the way. The cord is left lying just where it

is: and the internal oblique muscle and the conjoined tendon, which varies very much in strength and muscularity, is sutured with strong catgut on a curved round-bodied needle, by a series of interrupted sutures, to the deep fibrous ridge of Poupart's ligament, the last suture taking up the upper end of Gimbernat's ligament. The aponeurosis is now sutured by a fine catgut suture on a curved sharp-bodied needle in such a way that the upper flap widely overlaps the lower. This may be done by one continuous suture. which first enters well above the cut edge of the upper flap and takes only the cut edge itself of the lower, and then back through the upper flap like a mattress suture. The effect of this manoeuvre is to draw the lower flap right under the upper; and the suture is completed by bringing the cut edge of the upper flap down and sewing this by a plain continuous suture to the aponeurosis, below the level of Poupart's ligament, that is at some distance lower down than the original aponeurotic incision. This overlapping of the aponeurotic flaps may be done in the other direction, if more convenient, the final sutures fixing the edges of the lower flap well up on to the aponeurosis of the abdominal wall. All the divided vessels are ligatured with fine catgut, and when every trace of bleeding is stopped, the skin incision is exposed by removing the gauze fixed to its cut edges. A series of silk-worm gut sutures on sharp curved needles are now inserted well beyond the edges of the incision but left untied for the moment. The skin edges are fixed with metal clips, or sutured with fine iodised catgut - preferably *not* formaline —with a fine curved sharp-bodied needle by a continuous blanket suture. The wound is then painted with iodine and a long sausage-shaped pad of sterilized gauze, rolled round a piece of sterilized cyanide gauze, is laid on it and the silk-worm gut sutures tied over the pad. This forms an 'anchored dressing', which has the advantage of making equable pressure on the dead space below the skin incision and preventing oozing or the accumulation of serum. No further dressing is applied.

When anchored dressings are not used, clips are generally applied to the wound, which is then painted with iodine and a piece of dressing placed over it, but not fixed in any way. In this case, a small, properly shaped sand-bag is applied over this dressing to exercise pressure, for four hours after the operation, and so prevent serum collecting. When considerable dissection has been necessary, the wound is painted with iodine, a good thickness of cyanide gauze placed over it, and then large pieces of dressing, all of which are fixed with a firm spica bandage.

If, for any reason, a tube is necessary, this is placed deep in the wound and brought out of its lower end, and fixed there with a fine silk-worm gut suture to one side of the incision, or prevented from slipping by impaling it near the end with a sterilized safety pin. In this case care must be taken to wrap a piece of cyanide gauze round the pin, or the end of the tube, to prevent discomfort from the pressure of the bandage.

After the operation is completed, the patient is carefully lifted on to a trolley and taken back to the ward and kept in the same position he occupied during the operation. If he has had stovaine, he is kept well propped up, and, if chloroform, just as carefully kept recumbent.

The treatment of the immediate after-effects of the anaesthetic follows the usual principles and, if everything goes well, the bowels are

opened by sulphate of magnesia or enema, or both, in forty-eight hours' time. The clips are removed on the eighth day and the patient goes out any time after the twelfth, according to the individual case. Anchored dressings are removed by cutting the silk-worm gut sutures in 6-10 days, and the clips are taken out at the same time. If catgut has been used for the skin, it is painted again with iodine and allowed to come away by itself.

Should a hernia go wrong it is generally due to a faulty stitch, or to the subsequent oozing and infection of blood or serum under the skin. Fomentations must be at once applied, after one or more clips have been removed, and, if necessary, one must not hesitate to remove them all, put in a tube, and re-suture the wound, when the infection has passed and the wound is clean. I am glad to say that, in spite of many obvious disadvantages under which we suffer, and, more particularly, in having for nurses only partially-trained male attendants, our clean operations have a very high percentage of aseptic results. (Further reference is made to the practical points of this operation in the section on Hernia.)

ACCIDENTAL WOUNDS. The principles we have just enumerated for the clean treatment of operation wounds apply, as far as possible, to accidental wounds also; but, by the nature of the case, an antiseptic, rather than an aseptic, method is followed.

Our practice with respect to all wounds due to accident or design, other than operative, is essentially that described in modern text-books, and we need only briefly describe the broad lines of treatment we adopt.

In most cases, either in clean, or comparatively clean, incised wounds, without loss of substance, we endeavour to keep the wound and its surroundings dry; and, with this object in view, iodine is freely used; both to the wound itself and around it, after a preliminary cleaning with alcohol, whenever practicable. It is extraordinary how well this almost primitive procedure acts; and it is almost a universal rule to find scalp wounds, and flesh wounds generally, heal entirely by first intention, provided always that the ordinary principles of treatment for such wounds are faithfully followed. After the application of iodine in this way, and the proper cleaning and suturing of the wound, dry sterilized cyanide gauze is applied as a dressing immediately over the wound, and sterilized dressings, secured with bandages, over all. Cyanide gauze, soaked in carbolic or lysol, is equally effective as a dressing, but used in this way it soon becomes a dry dressing.

While the dry method is generally the best for quite recent cases, the extraordinary success of *saline and eusol* in military surgery has led us to adopt these methods in our own practice, with equally successful results. We have come to the conclusion that, if we have the opportunity of treating a wound soon after its infliction and before any active septic progress has occurred, 5 % saline solution, used in all the various ways before detailed, acts splendidly; but, when sepsis has got well started and appears to be extending into the depths of the wound and into the tissues beyond it, eusol, applied in the same fashion as

saline, is much to be preferred. As my friend Clayton-Greene said when I expounded my view of this subject to him : " Yes ! Exactly ! So long as your wound is clean you can keep it clean with saline, but when it is, or becomes, septic you treat it with antiseptics." And that would seem to be the case. For example, if we find that a bad compound fracture with a large lacerated wound does not do well with iodine, we do not order saline, but, at once, change to eusol, irrigating the wound well with it, then packing it lightly with gauze soaked in eusol and keeping it constantly wet, and with a warm eusol fomentation over all. This method is, in most cases, quite as effective as constant irrigation with either saline or eusol, is infinitely less trouble to the nurse, and much more comfortable for the patient.

In extremely septic cases much we have written in the section on septic wounds applies here also, and throughout we have presumed that all the principles of fixation, drainage, elevation, proper suturing of the wound, etc. have been adopted, principles common to modern surgical treatment of wounds in all parts of the globe.

The prophylactic injection of anti-tetanic serum must never be forgotten.

XI. LOCAL EXPERIENCES OF BULLET WOUNDS.

The whole subject of wounds produced by projectiles of all sorts and kinds from all the many modern machines of war is still being written. Our own small contribution to the matter cannot influence the final conclusions, but may serve the useful purpose of a first guide to the inexperienced Egyptian graduate, should he ever be called up for military service and have to take his place in a base hospital.

Our experience here has been gained from the treatment of Turkish wounded from the desert, and British troops from the Dardanelles and frontiers of Egypt ; districts in which there is very little if any cultivation, and where the risks of tetanus and, to some extent, also, septic infection are reduced to a minimum. Moreover, the actual transport of the wounded from the firing line to the base hospitals was generally carried out under favourable and speedy conditions ; though we had several instances of the dangers arising from the onset of sepsis and further injury of soft parts by movement, among injured men who were not found for some time after the infliction of their wounds.

In the Lancet of March 18th 1916, I published an article entitled "Some notes on the treatment of the Turkish wounded from the Suez Canal", and propose to summarise the results we then obtained, together with our more recent experience with British troops later in the year 1915.

All the Turkish fighting took place on the eastern side of the Canal, which is sheer desert without any cultivation whatever, and thus the conditions for the healing of wounds were primarily favourable. The wounded were left lying for a variable time on the desert sands, both on account of the difficulty of finding them—the area of battle extended over a considerable length of country—and the presence of wandering bands of the enemy. Those who were early found and treated at once by first aid, and then quickly transferred to hospital and promptly dressed, did very well as regards sepsis. Those who had been lying for twenty four hours or more—some even up to three or four days—before being picked up, did badly ; as did those who could not be dressed regularly, from stress of work in the clearing hospitals during the first rush. These cases invariably suppurated.

These results are exactly what might be expected from our knowledge of the possibilities of septic infection ; and prove the contention that sepsis may be prevented in a wound if steps are at once taken to fight it with proper weapons.

THE TYPES OF SEPSIS varied considerably.

(1) Probably the worst case of our first series was that of a patient who had a large compound fracture of the thigh, and had been left three days in the desert before he was found. He was sent straight to Cairo, and arrived with a very high temperature of a virulent septic type, with intense septic jaundice and violent nocturnal delirium. He started a rapidly-spreading cellulitic inflammation all round the wound, which soon spread upwards, in an erysipelatous rather than a gangrenous way, and he died two days after admission.

(2) Another, with a perforated bullet wound right through the upper end of the tibia, started more insidiously but rapidly got worse, his sepsis evidently originating in a primary focus of acute osteomyelitis in the cancellous tissue of the head of the bone.

(3) Others became badly septic quite suddenly a few days after admission, either from decomposing blood clot in the depths of the wound, or from a primary spore infection, which took some days to develop into pus-producing septic organisms. A few of these cases became rapidly gangrenous and died within thirty six hours of the onset of the septic temperature. Owing to the possibility of this deferred sepsis, which may arise at any time during the healing of the wound, and sometimes even after all danger appears to be past, the future is uncertain for some time after.

(4) In fortunately few cases a typical *gas gangrene,* similar in all respects to the type which has proved so fatal in France and elsewhere, developed with startling suddenness; and in spite of very vigorous measures, and even of immediate amputation, nearly always proved fatal in record time. We noticed that these cases 'looked the part,' the face becoming pale and then grey and giving the patient the appearance of being desperately ill, before there was evident emphysema or other incipient signs of gangrene had actually appeared. This 'look' of gangrene and a sudden rise of temperature were always our first danger signals; and, invariably, in the course of a few hours, the local signs appeared and progressed at galloping pace. A haematoma or other collection of effused blood, especially in torn muscles, and in connection with a compound fracture, acts as a splendid medium for the growth of spores—or germs—of gas gangrene.

The details of gas gangrene must be studied elsewhere.

We were always on the look-out for tetanus, but fortunately escaped it, a tribute, I think, to a large extent, to our care in giving every case at all likely to develop it a good prophylactic injection on arrival.

TYPES OF WOUNDS. The majority of cases were bullet wounds, but the general principles of treatment do not necessarily vary with the nature of the projectile, however diverse it may be in size or shape. Bullets, shrapnel, and other fragments of various kinds were not removed indiscriminately as such, but only when they were in a superficial or exposed position, or were likely to produce, or were producing actually, pressure, irritative, inflammatory, or other dangerous symptoms. Each case requires to be carefully considered on its merits with good and, if necessary, stereoscopic X-ray photographs to help one; but, it is an experience, common to all who have had the surgical management of these cases, that much more harm than good can often be done by an injudicious ('carnivorous') search for a quiescent and frequently comparatively harmless bullet or shrapnel.

GENERAL LINES OF TREATMENT ADOPTED. In *clean cases,* in which the bullet had passed straight through the soft parts, the entry and exit wounds were painted with iodine and left quite undressed, or were

dressed with cyanide gauze and sterilized dressings. Apart from possible injury of vessel, nerve, important muscle, bone, or joint in transit, all these wounds did splendidly. The track was left severely alone and gave no trouble.

When either *wound was large or ragged,* iodine was poured in and a piece of cyanide gauze used as a packing till the wound granulated up.

The above were the mild cases, but, in the case of more *severely lacerated,* and becoming dirty or definitely dirty wounds, these were enlarged by free incisions and good drainage provided by tubes, or by eusol-soaked gauze. Eusol, either as a bath, or irrigation, or fomentation, was then applied and continued till all sepsis had passed, when the wounds were dressed like any other healing sores. Only in the very rare cases where eusol appears to act as an irritant was a 5 % saline solution substituted for it.

Only very rarely was the track itself excised and then only to ensure exit for pus, which might tend to collect in spite of the drainage.

It is not always possible to procure eusol at short notice, in which case we used cyllin, usually in a ½ % solution, with very good effect and without any irritant or toxic symptoms. Saline may also be used as an alternative; and, in deep wounds, washing them out with warm oxygen water and then packing them with gauze soaked in Merciere's balsam of peru mixture acted very well indeed. The formula is eucalyptol, guaiacol, and iodoform, āā 10.0; balsam of peru, 30.0; ether 100.0.

In *lacerated wounds without an exit,* the track was well opened up, well irrigated with eusol, and lightly packed with eusol-soaked gauze.

Very *bad septic wounds* with much loss of tissue were immobilised as thoroughly as possible—and especially so if they communicated with a fracture—and then soaked, irrigated, fomented or dressed with eusol, with all the other measures and drugs previously detailed in the treatment of septic wounds generally. In such cases cyllin acts as a very satisfactory substitute for eusol also.

From the foregoing it will be seen that our experience led us to the conclusion that eusol was more generally satisfactory than saline, which is to be preferred in quite the early cases where sepsis is threatening. Cyllin, too, has often proved itself of exceptional value, either of itself or as an alternative to eusol.

If any good is to be done for *gangrene,* and especially gas gangrene, free incisions or amputation, followed by drenching of the parts with eusol, is most likely to prove beneficial; and here, too, the prompt employment of eusol by intra-venous injection may do what appears to be the impossible. The danger of gas gangrene supervening appears to lie especially in the large masses of sodden, inflamed, and commencing-to-be-emphysematous muscles in the depths of the wound; and in the extravasated blood in the substance of the muscles, in the inter-muscular planes, and in the inflamed subcutaneous tissues. Only free incision and freer drainage of the affected soft parts, generally after amputation, offer the least prospect of cure.

Our amputations hitherto in these cases have been of the simple guillotine type, with circular division of all the soft parts and the bone at the same level ; but, in future, I should certainly adopt Lynn Thomas' suggestion and make a circular incision through all the soft parts below the points selected for the division of the bone, slit up the tissues laterally to the saw-line, so as to make two flaps of all the soft tissues, and then saw the bone at the higher level. This operation leaves two flaps (parts of which may possibly become gangrenous later and separate) which are brought together by a suture or two over a mass of eusol-soaked gauze, with tubes projecting from each angle of the stump. The further dressings are on the usual lines for such cases.

BULLET WOUNDS OF THE HEAD. The injuries produced on the head by bullet wounds varied very much in their severity. The milder cases consisted of scalp wounds involving the skin and subcutaneous tissues, but not opening up the deeper dangerous areas. These healed quickly, but deeper wounds which had penetrated the aponeurosis were very slow to heal, and notably over the temporal fossa and supra-orbital region, though they remained clean when freely opened up. When still deeper, and especially with entrance and exit wounds in close proximity, an exploratory incision was always made and it was frequently found that the bullet had not only grazed the bone but had also produced a depressed fracture of the gutter or pond variety. However slight the external injury to the bone, trephining should be done, and one very often found much splintering of the inner table and, in a certain proportion of cases, injury to the brain and its membranes.

In the milder cases of visible injury to the bone, with or without depression, this exploratory trephining must become the routine treatment and the condition met with should be dealt with on general surgical principles.

In the more *severe bone and brain injuries* from projectiles of various kinds, all the modern methods for fractured skull and septic wounds in general must be carefully followed. These include the incision, as far as possible, of the injured area in the soft parts, the enlargement of the hole in the bone, the removal of broken pieces of bone, bullets or fragments of any kind, and the free opening up and drainage of the deeper parts involved in the injury. Thus, in the case of a wound produced by a bullet which has completely perforated the head, both entrance and exit wounds in soft parts and bones must be dealt with thoroughly in this way ; and, with eusol or saline dressings and drainage, the case is given its best chance of recovery, which will be partial or complete, depending upon the area and extent of the damage.

Haemorrhage from penetration of the lateral, superior longitudinal, or other venous sinuses may prove very dangerous. This complication and all others of the same degree of severity and danger must be treated exactly as though they had occurred in ordinary civil practice, with our added knowledge of the best and most scientific procedure, as tried and proved on all the different fronts of the war zone.

We had four cases of complete perforation of the head. In one case the bullet entered in front, just to the left of the middle line through the parietal bone, and came out through the right occipital. In this, as in all others of a similar nature, the wounds of the soft parts were enlarged at each opening. The opening in the skull was cleared by the removal of all loose pieces of bone, and still further enlarged by rongeur forceps to provide as free a vent as possible. This particular case did well for fourteen days and then developed hemiplegia, and on reopening the wound an abscess was found deep in the wound and involving a good deal of broken-down brain tissue in the motor area. The patient improved to some extent, but on his transference to the Red Crescent Hospital, the hemiplegia was still present and was likely to remain.

In another case the entry wound was in the left temporal region and the exit above the upper margin of the right external angular process. The same treatment was adopted as in the case just narrated, and the wound healed well and cleanly; but the patient was quite blind, the optic nerves having been completely divided in the track of the bullet. Another bullet ploughed through the anterior third of the left eye, bored a hole through the bridge of the nose, and then passed straight across the cornea of the right eye and out through the lid. The left eye was quite disorganised and the right globe was burst, but the wounds themselves healed well. One bullet entered by a tiny opening just above the inner canthus of the left eye and was removed from the muscles of the back of the neck to the right of the middle line behind. The bullet was hardly scraped at all and the patient recovered completely with only a little traumatic ethmoiditis and laryngitis. At one stage of his convalescence he had some hallucinations, but these were not at all serious and were probably largely assumed for the benefit of the students.

One negro had a similar wound in the upper occipital region, and on exploring we found a tightly-wedged depressed piece of bone projecting into the lateral sinus. Severe bleeding followed its removal, but this was easily controlled by pressure and the wound was left packed. All went well for a week and no further haemorrhage had occurred, when the patient suddenly got a temperature of 40° C and death took place the next morning. Post-mortem examination revealed a very extensive laceration of the brain posteriorly and much old blood clot under the dura mater, but it is not easy to understand why the patient died so suddenly.

Of the other fatal cases of head injury one had a very extensive bullet wound involving the greater part of both occipital lobes. The bones were hopelessly smashed and the brain pulped beyond hope of repair. All the fragments of bone were removed and the patient lived for several days, quite unable to speak, but conscious until near the end, which came rather suddenly with symptoms of septic meningitis. Another patient injured in the same region had absolute blindness and died from an obviously basal meningitis. There was only one severe case of hernia cerebri and it terminated fatally.

Perhaps the most interesting of all the head cases was one in which a bullet entering the right cheek had torn up a great deal of the soft palate and uvula and passed through the left cheek. On admission the patient had acute dyspnoea, with marked oedema of the uvula and

probably of the larynx also. Tracheotomy was immediately performed with great relief. All the acute symptoms passed off, the tube was removed, and for ten days all was well. Then difficulty in speaking was developed, with ataxia, paresis, and finally hemiplegia of the left side and all the symptoms of a pontine tumour. There was a gradual improvement with large doses of iodide, and on his discharge the patient was able to walk badly and still had signs of a basal brain lesion.

WOUNDS OF THE THORAX. There was a good variety of cases of this kind. Some of them showed no signs of internal injury whatever, although the bullet had obviously passed straight through the lung, and in one case the upper part of the pericardium must have been pierced. The majority of these cases had all the usual symptoms common to perforating wounds of the chest and nearly all developed haemothorax. One fatal case had a large opening to the left of the sternum, in the fourth interspace, through which, when he breathed, the air whistled with considerable force and noise. He was altogether too septic on admission to hope for any other result. Another patient died from heart failure, with severe cough, which nothing seemed to relieve, and which continued after the pleural cavity had been evacuated of all the blood it contained and free drainage had been provided.

We came to the following conclusions in the management of chest cases :—

If the case is doing well let well alone and do not interfere more than to provide the most comfortable position for breathing. This is often sitting up in bed or in a chair with the head resting on a pillow on a bed-table. In these cases the rest of the treatment is entirely symptomatic and is directed towards controlling the cough or restlessness and providing sleep.

If the haemothorax and the dyspnoea are increasing aspiration should be done, and repeated as often as necessary, provided the temperature remains normal or only slightly elevated.

If the temperature rises with an increasing dyspnoea, and especially if it has or assumes a septic type, excision of rib must be done at once and free drainage provided. It is hardly ever necessary to wash out the pleural cavity after this operation, as once adequate drainage is secured, the local condition rapidly improves and the general symptoms of septic infection disappear. In two cases where the haemothorax was very large and was producing cardiac displacement the blood was evacuated, after excision of rib, with much relief to the dyspnoea; but a mild degree of septic infection occurred within the pleural cavity, and the convalescence was unduly prolonged. These two cases confirmed our opinion that such effusions into the pleural cavity should not be treated more radically than by aspiration unless a septic temperature affords definite evidence that suppuration is impending. We were able to prove this contention still more definitely by examining the fluid withdrawn by a fine hypodermic needle. Cases doing well invariably gave a sterile culture; but with an increasing dyspnoea—due to the onset of a septic inflammation in the pleural cavity—even before the temperature chart took on a septic character, we always found streptococci, frequently with pneumococci, in the cultures. It became our custom in all but the absolutely straightforward cases to give repeated doses of stock pneumococcus vaccine. (Wright).

The foregoing remarks apply only to cases in which the wound has been very small and has completely healed without suppuration; but it is, of course, entirely otherwise when the track of the bullet is still septic and opening into the chest cavity. Here we have to deal with a septic penetrating wound of the chest, with or without haemothorax, and treatment follows the usual lines. The importance of providing free and counter drainage in such cases need hardly be insisted upon; and in many cases B. I. P. paste has been used with considerable success, as already mentioned in a previous section.

Fractured ribs were not at all common, except as part of a penetrating wound of the thorax, and gave some trouble from subsequent necrosis.

In any variety of chest wounds pneumonia may occur and must be treated in the open air as far as is reasonably possible, and with pneumococcus vaccine as well as the other measures, especially cardiac stimulants, appropriate to the condition. Such cases must be kept in the sitting position by means of a special bed, and this, with the open-air and the vaccine, forms the most important part of the treatment.

Much good work has been done in these chest cases with special apparatus, which we in Egypt are never likely to see here, and I have therefore confined myself to describing the various methods within our means, and to indicate the most generally useful and practical measures.

WOUNDS OF THE SPINE are usually very hopeless conditions. The destruction of bone which is almost inevitably present, the destructive effect the bullet has on the spinal cord itself, the possibility, even if the cord does escape, of meningitis occurring from the septic wound, all contribute to the hopelessness of the injury; and, beyond alleviating the patient's misery and his pain by morphia and the like, and ordinary surgical principles and good nursing, nothing further can be done.

WOUNDS OF THE ABDOMEN. We have mercifully had only a small experience of abdominal cases and have throughout followed the usual peace-time principles, as illustrated by a perforating or stab wound of the abdomen. Expectant treatment can only be followed so long as the patient's condition, both local and general, is quite definitely improved hour by hour; but, in the majority of cases an early exploratory laparotomy, with a quick, but thorough search for injury to intestine or other viscus, and the arrest of haemorrhage, is the proper treatment. The treatment of the injured gut or other injured part in no way differs from that encountered in ordinary civil practice; but, from the nature of the injury and its accompanying general nervous shock, the prognosis is infinitely graver.

(Further reference is made to this subject in the Surgery of the Abdomen.)

WOUNDS OF THE SHOULDER AND UPPER LIMB. At one stage of the fighting a number of Turks were caught between two rows of trenches disposed almost at right angles to each other and, being thus enfiladed, many received oblique wounds across the shoulders or through one side of

the chest and the upper arm. Among these cases the most interesting may be briefly mentioned. One man was hit, possibly by a shrapnel bullet, in the middle line of the spines behind. The bullet apparently split and a deep track ran outwards above each spine of the scapula, and fragments of fractured scapula were found in each wound. After opening up the tracks freely and applying constant fomentations the primary sepsis was controlled and the case did very well. In several cases the acromion was fractured and in one of these the bullet traversed the chest beneath and fractured two ribs on the same side in its exit. One bullet missed all the bones about the shoulder, but evidently caught a part of the brachial plexus, with paralysis of the left deltoid and biceps.

Fractures of the upper end of the humerus were best treated by a pad in the axilla and fixing the arm to the side of the chest without the use of any splint. When lower down in the shaft of the bone, whether simple or compound, we had our best results and made the patient most comfortable with Robert Jones' rectangular or straight arm-splints. Only one case of compound fracture of the humerus was plated, and it served an excellent object lesson as to how not to do it; for the bone was found so comminuted and brittle that no screws would hold and eventually a wire had to be placed round the fragments. No further operations of the kind were performed and this was only done in the hope of temporarily holding the fragments in position. Extension on the straight arm-splint did all that was required, and the result was a very good one. With these two splints and the occasional use of a Middeldorf splint with extension we were able to deal with all our cases quite satisfactorily, and if not, special metal splints would be made for each particular case.

One particular case of a deep shrapnel wound in the substance of the pectoralis major was interesting because of the association with it in the same patient of a long bullet track in the thigh, which had opened up the intermuscular planes for a considerable distance, though the bullet itself was removed near the upper end of the track. This was evidently an instance of splitting up along fascial planes between muscles by the cone of air projected in front of the bullet.

Some bullets were lodged in the *axilla*, especially along the axillary border of the scapula, and these cases showed the fallacies in X-ray photography in attempting to localise a bullet from a single plate. In one case of this kind the bullet appeared to be at the upper end of the axillary border, but was found firmly imbedded between the axillary artery and vein in mid-axilla.

Wounds about the *elbow* varied much in severity. Perforation of the lower end of the humerus generally led subsequently to impairment of movement of the elbow joint and was very painful. The olecranon and the head of the radius did not escape, but with these injuries the end-results were fairly satisfactory. Fractures of the *bones of the forearm* were common, but presented no special peculiarities except for the explosive effects sometimes produced. Two cases in which the bullet completely traversed the *wrist* did very well, with some swelling of the joint, but with very good and ultimately perfect movement. The *metacarpal* bones were often severely smashed. In the worst cases the victim was actually holding the end of the rifle when it was fired.

BULLET WOUNDS OF THE PELVIS AND LOWER LIMB. Whenever a bullet is localised in the pelvic cavity and is doing no harm it is best left alone. This, in our early days, was brought home to us when we were tempted to make futile search for such a phantom. When a buried bullet is exercising pressure on a nerve, or producing pain or disability from its presence in proximity to important structures, an attempt—and I use this word advisedly—should be made to remove it, after having its position localised by the best means at our disposal. It will not always be found, even then, and care must be exercised lest this "carnivorous" surgery be pushed to a dangerous extent. One of the best of our cases was that of a penetrating wound in which the bullet had gone through one buttock, straight across the pelvis, and out through the other. Blood and faeces were draining from each wound, and an examination of the rectum showed a large tear in each lateral wall. The external wounds were well opened up and drained with tubes and a large tube was placed in the rectum, extending well beyond the wounds in the wall. The patient was then put to sit in a bath for some hours at a time and did well, but had much pain in the rectum. This was at once relieved when the external sphincter was divided, and he continued to do well and recovered completely. The question of an inguinal colotomy was discussed, but improvement was so rapid after the division of the sphincters that nothing further was necessary.

Two cases of deep wounds into the *iliac fossa*, which fortunately were extraperitoneal, did well when the wounds were opened up and allowed to drain of themselves, without a tube but with light packing of gauze soaked in balsam.

Some very extensive *fractures of the femur* were met with. In a certain number the wounds healed without any sepsis, and a Thomas' knee-splint was then applied with fixed extension and proved most satisfactory, even in cases where there was considerable comminution. In compound cases this also proved to be the most satisfactory splint, both before and after operation. Wallace's splint proved most useful also. Free incisions were made whenever there were any threatenings of gangrene or sepsis, and only the very much splintered and completely separated pieces of bone were removed. One patient died from gangrene and another from virulent sepsis. The best case of the series was one in which there was great comminution, the bone being splintered to such an extent as to give the sensation of emphysematous crackling. This on investigation by incision turned out to be caused by the presence and rubbing together of tiny pieces of broken bone in a bed of blood clot. Nearly three inches of the pulped shaft of the femur was removed, but fortunately a long splinter of bone projected from each fragment and nearly touched posteriorly. By free drainage, fixation on Thomas' knee-splint, and repeated packing with the balsam dressing, an excellent result was obtained and quite a presentable femur remained. All cases in the shaft of the bone were treated on these principles, and open splints, more particularly Hodgen's, Mothersole's, interrupted Bryant's, and, better than all, Thomas' knee-splints, were called upon. In difficult cases prolonged and sufficient extension was most essential. In fractures of the lower end of the bone much the same tactics were employed, and in one case with a penetrating wound of the knee-joint frequent irrigation with cyllin proved very satisfactory.

Injuries to blood-vessels were conspicuous by their absence, the only one of any importance being that of a very large haematoma of the thigh, which eventually had to be opened and the profunda femoris tied. The haemorrhage here had been very extensive, and unfortunately the case terminated fatally shortly after the operation.

One other case of compound *fracture of the tibia and fibula* became very septic and developed a traumatic aneurism of the anterior tibial artery which rapidly increased in size and began to bleed. Before anything radical could be done emphysematous crackling occurred and a rapidly spreading and fatal gangrene supervened. A case of perforating wound of the tibia became acutely septic and ended in a very severe septic dysentery, and, finally, general septicaemia which resisted all treatment.

We had one successful case of gangrene in a fractured tibia and fibula in which crackling came on quite unexpectedly, and this was saved by very prompt and vigorous incisions, drainage, and cyllin irrigations. Most cases of this variety of gangrene, however, once the process had really set in, were rapidly beyond all surgical treatment.

Injuries to nerves were uncommon, the posterior tibial and the external popliteal being the only two nerves involved, except for one case of ulnar concussion.

Wounds of the *metatarsal bones* were very rare. Penetrating wounds of the larger tarsal bones were very painful and became very septic, probably from the large amount of soft cancellous bone liable to infection. Especially was this the case in wounds of the heel. Apart from these slighter injuries there were several very severe and septic smashes of the foot opening up the ankle-joint. Two of these required amputation for advancing sepsis and among them were two fatal cases.

Amputations were surprisingly uncommon and, provided that the circulation beyond the injury was maintained, and good and steady fixation could be arranged, the effect of saline and eusol in what appeared at first sight to be hopeless cases, was little short of marvellous. When, however, there was the least suspicion of gangrene not clearing up after free incisions, amputation was imperative, clear of the actual injured part, if possible. However it is done the flaps should be left widely open, as before described, and only closed when every trace of sepsis has disappeared. The line of the amputation should be selected to allow of the proper fitting of any artificial limbs at a subsequent date, and care taken to prevent the stump, if near a joint, from becoming contracted, and so rendering fitting more difficult.

WOUNDS INTO JOINTS require most careful attention to ensure future movement. A good general routine is to thoroughly examine the case under an anaesthetic and, under the best aseptic conditions, excise all the injured soft parts right up to the capsule of the joint. The hole in the joint may then require enlarging to permit of the removal of foreign bodies of all kinds from its interior. This is effected under a constant irrigation with hot normal saline solution. All particles of lead, bone, cartilage, dirt, clothing and blood are washed

away, and tubes inserted down to, but not into, the capsule of the joint in several places. The joint is thoroughly fixed on appropriate splints and then placed in such a way that continuous irrigation with 5 % saline or eusol can be easily carried out. When the necessity for irrigation has passed, gauze soaked in saline or eusol may be lightly packed into the wounds and the whole dressed with a fomentation of the same solution. Only when the wounds have healed must any attempt be made to move the joint actively, but gentle passive movements are begun earlier as soon as the splint can be discarded. Later, massage and regular and increasing movements are very essential to ensure a freely movable joint. The treatment of such cases with Bipp is now becoming general.

Amputation may be necessary in very bad cases, especially when the bones above or below have been injured by the bullet and a septic osteo-myelitis starts to develop.

ARTERIO-VENOUS WOUNDS AND TRAUMATIC ANEURISMS are common in bullet wounds of the limbs and sometimes show themselves almost at once, but may give no external sign for several days after the injury. If the bullet traverses the artery in its course through the limb, haemorrhage may be severe. This, of course, necessitates the immediate application of a tourniquet and an operation to ligature the divided vessel above and below the wound. Provided the artery is not too large, and haemorrhage has not been excessive before pressure was applied, the results in such cases are very good. If the vein is injured as well, it will naturally require ligature also but it must be carefully left intact if it is uninjured.

Traumatic aneurisms and arterio-venous wounds in the *forearm* may sometimes be treated by carefully isolating the artery above and below the swelling, with a tourniquet on the brachial artery, and then ligaturing all the supplying vessels ; but when close to the elbow, or when the swelling is intimately incorporated with the deeper muscular structures, ligature of the brachial artery in the lower part of the arm is necessary. This must be done also in all cases of severe injury in the forearm in which anything like a dissection of the pulsating swelling, either above or below, is out of the question.

When the wound occurs in the vessels of the *arm* it is usually only possible to ligature the supplying artery above the swelling and at some distance above it.

When the *axillary and subclavian arteries* are the seat of the injury, and, also, when the main arteries of the neck are involved, the rules for treatment follow closely those generally observed in the case of aneurisms on these vessels from any other cause ; and the literature of the war on these subjects must be consulted before undertaking any such serious operations.

The same general rules apply to *wounds of the arteries of the thigh and leg*, the important point to decide being whether it is necessary

to ligature the femoral,or the popliteal artery in the thigh. In most cases of at all severe destruction of soft tissues of the leg with a pulsating swelling, the only safe procedure is ligature of the main vessel low down in the thigh. When the femoral artery is pierced itself, early ligature of the vessel, saving the vein if possible, must be done, but every effort must be made to avoid ligaturing the artery above the origin of the profunda femoris. Rarely, with careful control of the artery above by digital compression or tourniquet, we may cut down near the actual injury and securely ligature both artery and vein above and below. The greatest care must be taken, by warmth, elevation and gentle support by flannel bandages, to help and maintain the new collateral circulation through the limb.

INJURIES TO NERVES require prompt and careful treatment. As soon as the wound is thoroughly healed and there is no sepsis, the supposed injured nerve should be explored by a free incision. In many cases the nerve is found to external appearance quite intact; and, beyond clearing it of any scar tissue around it or adherent to it, nothing further can be done : and the prognosis as regards ultimate cure is good, though it takes a very long time, with much massage and movement, before sensation and motion are absolutely restored. In other cases the nerve may be firmly caught up in a mass of scar tissue and should be very carefully dissected out from it, surrounded with a sleeve of Cargile membrane or fat, and left without further suture. Restoration of function will occur after a considerably longer time, especially as it is likely that most, if not all, of the nerve fibres have been divided by the bullet and are now replaced by a mass of scar tissue. Those that are left are endeavouring to use this tissue as a bridge to effect a regeneration of the distal part of the nerve. When a nerve is found to be completely divided, freshening the divided ends and nerve suture must be practised. In these cases and, indeed, after all nerve injuries, massage and electricity, or both, must be systematically used to maintain the tone of temporarily paralysed muscles ; and appliances fixed to prevent contractures while the nerve tracks are regenerating. Further details of operative and mechanical procedure must be studied in this chapter of the literature of the war.

Throughout the whole series of cases of wounds from projectiles the influence of SHOCK must be always carefully considered ; and, though its effects vary very much in different individuals, it often exercises an important influence on the general condition of the patient, both at the time of the infliction of the wound and in its subsequent healing. Two of our cases, which came to us practically straight from the battle-field, died of shock, the outward and visible signs of injury being quite insufficient to account for death ; indeed, in one of the cases no injury whatever could be found at the autopsy.

Shell shock must be studied elsewhere.

This element of shock was particularly marked in a series of cases we had in the hospital, of persons injured in the streets of Cairo during *the air raid* of Nov. 13th 1916. The suddenness of the whole thing, and

the awful terror created by the dropping of bombs from the air, without any warning or chance of escape, contributed to the combined effect, and every case without exception was admitted in a condition of very severe shock and remained thoroughly un-nerved for several days. The injuries they received were comparable to those of some of our severest bullet wounds and nearly all became very septic ; and the mutilations both of living and dead were horrible in the extreme.

XII. POISONED WOUNDS FROM INSECT BITES, SCORPION STINGS AND SNAKE BITES.

The number of biting insects throughout Egypt is legion; but comparatively seldom is it that any serious septic or other surgical condition, due directly or indirectly to the bite, comes under our notice. Europeans, and particularly visitors to Egypt, are often very badly bitten by mosquitoes, sand-flies, fleas or bugs; but, at most, an exceedingly irritable and inflamed skin results with, in rare cases, a generalized furunculosis, which may possibly have serious septic results. The native Egyptian skin is either quite impervious, or at all events entirely indifferent, to the bite of any insect smaller than a hornet. Undoubtedly malaria, filaria, and many other insect-borne diseases are indirectly in the category of poisoned wounds, but have no claims for further notice in this section.

THE EGYPTIAN HORNET (Ar. Dabboor الدبور) is a particularly ferocious beast and inflicts a very severe sting. The pain is intense and, within a very short time, the whole part round the sting may be immensely swollen and very hard. All degrees of severity occur, the worst cases frequently giving rise to very serious symptoms. If, for example, the bite is about the wrist, the hand forearm and arm may soon be the seat of a very extensive oedematous swelling of almost stony hardness, which makes one fear for the integrity of the circulation of the limb, as there must be extreme pressure on the blood-vessels. The swelling is dull-red in colour and resembles that of a chronic oedema from lymphatic obstruction. With rest, and the constant application of hot bicarbonate of soda fomentations, the swelling loses some of its tenseness and slowly subsides; and I have never found it necessary to make any incisions to relieve the tension, though, at first, I was sorely tempted to do so. Once the swelling starts to go down it rapidly disappears but may leave behind it a mild degree of cellulitis. In most cases it completely clears. It will be readily understood that in children, or when the bite is on the face, a hornet sting may be a very serious condition.

Apart from alkaline fomentations or warm haseline compresses, no other local *treatment* is generally indicated; and, internally, stimulants, both medicinal and alcoholic, may be required, much as for snake or scorpion bites. An intense urticaria may follow a hornet and other similar stings, and for this calcium lactate internally, in doses of 0.30 three times a day, may be useful, with bran and carbonate of soda baths. A hypodermic injection of adrenaline (5 minims) sometimes acts like a charm.

SCORPION STINGS. Scorpions flourish exceedingly in many parts of Egypt; indeed, in Girgeh, at certain times of the summer it is said to 'rain' scorpions. In Cairo very few cases of scorpion stings are seen, but our limited experience coincides with that of our former graduates whose work lies in the thickly infested districts. In an

excellent research by my colleague, W.H. Wilson, Professor of Physiology, 'On the venom of scorpions', in the Records of the School of Medicine, Vol. 2, 1904, he deals with the whole subject in a masterly way and includes in it an account of the symptoms it may produce in man.

Dr Mohamed Shaheen, who was formerly at Edfu, remarks that 60% of children under the age of five years, stung by scorpions, die; but the percentage mortality diminishes rapidly as age advances, and it is very rare to see a fatal case in persons over the age of twelve. Fatal cases, even in adults, however, are reported.

The *symptoms* generally noticed are great pain of a burning character, radiating from the part stung. (The sting is often so tiny as to be only seen with the greatest difficulty and sometimes it cannot be discovered). Profuse perspiration is usual and excessive secretion of saliva, which streams from the mouth, with vomiting and, occasionally, hallucinations and mental disturbance, and, sometimes, convulsions. The pulse is very weak and thin and exceedingly rapid—up to 150-200 a minute—and respiration is very shallow and quick. The patient lies in a semi-conscious condition and may remain so for some hours. Recovery may then ensue with profuse sweating and a gradual subsidence of the other symptoms.

In fatal cases the patient falls into a state of collapse, with marked coldness of the extremities, and dies very soon. I have seen two cases in young children in whom recovery appeared to be complete, but in whom symptoms like deferred shock came on again and death occurred, with gradually increasing unconsciousness.

In most cases no local signs of swelling or oedema are present, but sometimes a red blush may surround the sting ; and, in one case, I have seen an enormous bluish swelling, extending all up the leg, from a bite on the toe, appearances very much resembling those of snake bite.

In adults there may be a feeling of faintness with nausea, or even vomiting, and a rapid pulse with some salivation ; but, generally, beyond a sharp intensely irritable pain at the sting, nothing further may be felt. The pain is sometimes described as a sensation of painful numbness radiating from the skin towards the trunk, resembling that produced by a blow on the ulnar nerve, and it may last for twenty-four hours.

We may condense our own local experience of scorpion bites as follows:—When a child is bitten the local signs may be quite insignificant, a tiny mark like a flea-bite being sometimes seen, though in a dark skin this may quite escape detection. Very shortly afterwards the child faints and may remain in a state of collapse for two or three hours, and then recover and appear to be quite well ; only to have a second attack of collapse a few hours later, which may progress to unconsciousness and death. In other children, and generally also in older patients, the local symptoms of pain, tightness, formication, redness, or a rapidly spreading purply oedema, may be present; with varying degrees of shock, delirium or collapse. Irregular muscular contractions of the limbs may occur, and even trismus, and gastro-intestinal symptoms not unlike those of irritant poisoning. Occasionally respiratory symptoms develop and the patient dies from asphyxia or pneumonia.

The *treatment* of scorpion stings, both local and general, must be entirely symptomatic; at the same time it must be very thorough and vigorous and follows the same lines as those of snake bites. The details of the treatment that may be necessary are described in the section on snake bites, to which reference must be made; but the greatest care must be taken to keep the patient thoroughly warm and stimulated, and to watch him carefully for some hours after his apparent recovery, lest a secondary collapse may occur. Ether and ammonia, sal volatile, and brandy by mouth, and strychnine spartaeine and digitaline by hypodermic injection, are the most useful remedies, in the absence of anti-venine. Whenever it can be procured an injection of scorpion anti-venine, as made originally by Dr. Charles Todd in the Department of Public Health Laboratories, must be given and repeated, and its value has been undoubtedly proved. As with snake anti-venine, it unfortunately is very often not at hand when it is most required and recourse must be had to the general measures detailed above.

The following are the instructions issued by the Department of Public Health :—

ANTISCORPION SERUM.

(For the treatment of scorpion stings.)

This preparation consists of the serum of horses which have been immunised against scorpion venom, and contains 0·5 % of carbolic acid as a preservative.

On keeping there is a tendency for a slight precipitate, consisting of albuminous particles, to be thrown down, and this occurs especially when the serum has been kept for long periods and at high temperatures.

The serum should be kept in the dark in as cool a place as possible, preferably in the ice safe, under which conditions it will remain good for at least a year.

DIRECTIONS FOR USE. The syringe and needle should be boiled and allowed to cool before use, and the site of the injection well cleansed and disinfected.

It is of the greatest importance that the injection be made as soon as possible after the sting.

To open the bottle:—There is a small file mark at the base of the neck of the bottle and at this point the neck can easily be broken off with the fingers.

Dose. The dose is 10 cubic centimetres for adults and 5 cubic centimetres for children.

Site of Injection. The injection should be made directly into the site of the sting. If the sting is in a finger or other position where it is not possible to inject the whole dose, as much as can conveniently be introduced without causing pain should be injected into the site of the sting and the remainder of the dose into some convenient region higher up the limb.

SNAKE BITES. A certain number of deaths from snake bites are annually reported in Egypt, but it cannot be said that such happenings are at all common and our personal experience of cases in Cairo is very small indeed. A very brief notice will therefore suffice, and I shall quote largely from my article on this subject in Choyce's Surgery.

Surgically we are interested only in the effect of the bite, not in the particular variety of snake responsible; and the prognosis depends upon the dose of the venom injected with the bite, its relative toxicity, the site of injection, and the age and power of resistance of the individual bitten. Thus, with kraits or large cobras, the bite may be almost immediately fatal, from paralysis of respiration and heart, when an overwhelming dose of toxic venom is injected. If, by chance, the venom is injected directly into a vein, it leads to general thrombosis, vomiting, collapse and death. *Small* kraits and cobras are quite common in Egypt.

In most cases, however, the outlook is not entirely hopeless, as from the bites of smaller snakes, such as the *Egyptian horned viper.* There is usually an intense burning pain around the two punctures of the bite, and local redness, with a rapidly spreading oedema, often almost purple in colour and patchy with extravasated blood. The swelling may extend up the whole limb and even on to the trunk. The victim is usually in a state of terror and may be suffering from severe shock ; he becomes faint and dizzy and finds himself unable to stand. He may suffer from profuse salivation and paralysis of the muscles of the tongue and larynx, and is soon attacked by paralysis, beginning in the legs but rapidly becoming general. Nausea and vomiting precede a gradual failure of respiration. Finally the heart stops and the patient dies, with slight convulsions, in from three to fifteen hours. Recovery may occur, however, and is usually rapid and complete, though death may supervene later from septic absorption from the bite, which in all cases is infected and heals but slowly, perhaps leaving ulcerated areas.

Treatment of these cases must, to be effective, be prompt and thorough. An elastic or other band, or several, must be placed above the bite, and then the bite cut out, or free incisions made through it and deep into it. In the case of a finger or toe, amputation with a knife or axe may be done at once. After incising the bite, or excising it, suction may be tried and then the whole raw area rubbed well with crystals of permanganate of potash, or thoroughly washed with a strong solution of this drug or of sodium hypochlorite. 20-30 c.c. of a fresh 1 °/₀ solution of calcium chloride may be injected into the soft tissues around the bite also. The appropriate anti-venine, if available, must be repeatedly injected ; and if improvement results the constricting bands may be taken off after three hours. The patient's general condition must be treated throughout as is necessary ; and shock counteracted by large and repeated doses of pituitrine and strychnine hypodermically, or spartaeine and digitaline ; while brandy, ether and ammonia, and other diffusible stimulants must be pushed. In the severest cases artificial respiration may tide the victim over his crisis.

With certain *vipers* and small snakes, quite serious symptoms may be produced ; but unless they bite young children, or the bite is on the face, or directly into a vein, these bites are very rarely fatal. The symptoms come on very rapidly with pain, redness, swelling in the bite, with extreme prostration, fainting and collapse and even death from heart failure and shock. *Treatment* must follow the same lines as described above for more serious cases.

Bites from *non-venomous snakes* often produce grave symptoms of fright and sometimes violent delirium; but this symptom is more frequently ascribable to the large quantities of brandy administered by anxious and misguided friends.

Mention has already been made of the presence of MAGGOTS in septic wounds derived from the larvae of certain flies; and the condition produced by the entry into the skin of the CHIGGER, or sand-flea, also requires passing notice, though it is practically never seen in Egypt. In certain parts of the Sudan and in East Africa it is exceedingly common.

Reference must be made to works on tropical diseases for all the other insects producing poisoning or irritating effects from their penetration of the skin. Rarely cases come to our notice in Egypt; but this country is mercifully free from the vast majority of them and only specialises in those we have so briefly mentioned above.

XIII. INJURIES AND DISEASES OF BLOOD-VESSELS.

The subject of HAEMORRHAGE in all its various aspects has a world-wide application and we have nothing to add of special Egyptian interest; and all that is written elsewhere in recent text-books on the DISEASES OF ARTERIES, applies to us as to all other peoples. We must once more draw attention to the frequency of *arterio-sclerosis* as evidenced by the prevalence of gangrene from gradual arterial obliteration, and this, sometimes, at an age when such degeneration does not usually occur. This question is dealt with in the section on gangrene. Another interesting local feature is the rarity of *syphilitic arterial disease*. It may be on both these accounts that aneurism of the arteries of the neck and limbs is almost unknown. I do not remember to have seen more than six cases; among them one of the popliteal and the other of the axillary, in the limbs; and one of the lower end of the right carotid artery, in all my experience in Egypt.

DISEASES OF VEINS are uncommon also, and in ordinary hospital practice one is struck with the extraordinary rarity of operations for varicose veins. Cases of enlarged veins undoubtedly occur, but are discovered accidentally and do not seek treatment for this condition. The very active life most of the agricultural population lead, and the entire absence of any constricting bands that might impede venous return, may contribute to this rarity. *Thrombosis* of the main veins, especially the femoral, appears to be particularly liable to occur with typhoid; and thrombosis in several different veins of medium size, without any well-recognised cause, is not infrequently met with. Intravenous injection of 50cc. of a ½ °/₀ solution of sodium citrate in water sometimes acts very well in all cases of thrombosis.

Similarly, tumours of blood-vessels, naevus and the like, are quite rare and are comparatively curiosities; even the familiar port-wine stain is very rarely seen.

XIV. DISEASES OF THE LYMPHATIC SYSTEM. FILARIASIS.

Egypt has her full share of *lymphangitis and the commoner diseases of lymphatics and lymphatic glands*; and more than her fair proportion of tuberculous glands, to which reference has already been made. Other enlargements of lymphatic glands associated with some general blood or splenic disease, or as part of a generalised malignant disease of glands, occur from time to time but are entirely of medical interest. It is very important, however, in all cases of recent glandular enlargement to find a cause for the condition; and, until this is done, the case must be kept under strict observation, as the possibility of bubonic plague must always be borne in mind. In the case of cervical glands also, an unsuspected diphtheria should always be carefully excluded.

As in most tropical and semi-tropical countries, the pathological effects of filarial infection are made manifest in a certain proportion of our surgical cases; and we must now consider the subject of FILARIASIS in so far as it comes within the scope of practical surgery.

The originator of the whole series of pathological conditions is the *Filaria Bancrofti.* This parasite is a long, hair-like, transparent, nematode worm, 7.5–10 c.m. long. The female is the larger and longer—8.5—9 c.m. long by 0.42—0.28 mm. in breadth—and is occupied in almost its whole length by two uterine tubes, filled with ova in various stages of development. The anterior end of both sexes is slightly tapered and club-shaped, while the tail tapers to an abruptly rounded-off tip. The tail of the male, moreover, is sharply incurved and curled. Male and female worms may be coiled together in balls and are thus found in cyst-like dilatations of the distal lymphatics; or they may lie more loosely, or in calcified groups, in lymphatic varices in the larger lymphatic trunks between the glands, in the glands themselves, and in the thoracic duct. (Bahr).

All the *pathological conditions* included in the term *filariasis* are due to the presence of these worms in their various forms in the course of the lymphatic system. Manson suggests that groups of *ova*, either fresh or calcified, may be responsible for the symptoms of lymphatic obstruction in certain limited areas.

The *embryos*, generally known as *Microfilariae nocturna,* are of themselves non-pathogenetic but are of considerable importance; as their occurrence in the peripheral blood affords evidence of the hidden presence of the adult filaria in the body. These embryos are long cylindrical worms, one end abruptly rounded off and the other finely tapering, 0.037 mm. in length, with a diameter about equal to that of a red blood-corpuscle. Each is contained in a very delicate sheath within which it moves backwards and forwards. To demonstrate the presence of microfilariae in the blood, films are best examined fresh; but, if this is impossible, the films may be dried and subsequently dipped, without previous fixing, in a weak solution of fuchsin - about three or four drops of the saturated alcoholic solution to the oz. of water (30.0). They are left in this stain for about an hour and then examined wet without a cover-glass. (Manson). In fresh specimens the

microfilariae will be seen in very active movement among the blood cells; and after they have quietened down can be readily distinguished. Many films may have to be examined before any microfilariae are found.

The examination must be carried out late in the evening. The microfilariae seem to enter the peripheral circulation about 5 p.m. and increase in numbers till midnight; after which they gradually decrease until about 8 or 9 a.m. the following day, when none are to be found. Manson suggests that they just wander out in the hope of being taken up by a particular mosquito, whose habits are largely nocturnal, and into which they must enter to pass through the further stages of their life-history. If, however, the patient alters his habits and sleeps during the day the embryos are found during that time and not at night. In certain places the microfilariae are found in the blood during the day and Bahr suggests that, in Fiji and the Pacific Islands, this fact is in part due to the day habit of their usual intermediary mosquito host there, the *stegomyia pseudoscutellaris*. During their absence from the peripheral circulation the microfilariae probably take refuge in the large arterial trunks, such as the internal carotid, and in the lungs.

Manson and others have shown that transmission from man to man occurs through the biting agency of *culex fatigans* and other mosquitoes, which extract the microfilariae with the blood from infected patients. In the mosquito the microfilariae undergo several changes, and pass from the stomach to the thoracic muscles and prothorax and finally into the proboscis. Thence they are injected into a new host in the act of biting and eventually reach the lymphatic system, where they become sexually mature as they reach their adult stages. Impregnation of the female here occurs and in the end ova and their contained embryos are deposited in the lymph stream. In due time these embryos or microfilariae, still contained in their stretched-out egg-capsule, which forms their sheath, pass through the lymphatic glands and enter the peripheral circulation; either by way of the thoracic duct and left subclavian vein or by the lymphatics of the upper part of the body.

This, very briefly, is the life-cycle of the parasite responsible for filariasis, and we must now describe the various changes it may produce in the human organism.

THE PATHOLOGICAL EFFECTS OF THE FILARIA PARASITE. A patient may be harbouring the filaria parasite for many years without suffering any ill-effects, but, sooner or later, the parent worms—or sometimes masses of ova—become fixed in some part of the lymphatic system and produce an obstruction in the circulation of the lymph. The lymph is dammed back and the lymph-pressure raised. This will lead to a dilatation and eventually a thickening and varicosity of the lymphatics, with lymphatic oedema or lymphorrhoea in the obstructed area. This obstruction may be complete from the first by an impaction

of worms in the lumen of a lymphatic with thrombosis resulting therefrom; or it may be partial at first and gradually become more complete, as the irritation leads to an inflammation, with consequent thickening of the coats of the lymphatic and thrombosis, or as a result of fibrous infiltration in the lymphatic glands. The ultimate effects in any case will depend upon the efficiency or possibility of the collateral lymphatic circulation. Thus, if the thoracic duct itself becomes blocked above the point of entry of the vessels bearing chyle from the intestines, the chyle can only reach the general circulation by passing in the reverse direction; by way of the abdominal and pelvic lymphatics to the lymphatics of the groin and scrotum and on, by those of the abdominal wall chest and neck, into the right main lymphatic trunk to the subclavian vein. The whole of this tract of lymphatic vessels, and the thoracic duct itself up to the actual obstruction, may became hypertrophied, varicose and enormously distended with chyle—or, if the obstruction is below the point of entry of the chyle-bearing vessels, with lymph—which may leak from the vessels on the slightest injury or may even exude without any breach of surface.

This is the essential pathology of lymphatic obstruction; and the conditions produced will depend entirely upon the position of the block in the lymphatic system, the degree and permanency of the obstruction, and the state and possibilities of the collateral channels. As will be mentioned again later, the attacks of inflammation set up from time to time in the lymphatics of the affected area tend to a progressive thickening and difficulty in the lymph circulation; and, unless a collateral circulation can be discovered and used, the degree and area of the obstruction becomes steadily greater.

Microfilariae nocturna are seldom found in the blood in well-developed filariasis and least of all in elephantiasis. This is due either to the death of the parent worms; or to the obstruction in the lymphatic area becoming so complete that the embryos cannot pass into the general circulation.

THE OUTWARD AND VISIBLE SIGNS OF FILARIAL INFECTION. We have pointed out that the general effect of the presence of adult filariae in the lymphatic circulation is to produce obstruction, more or less complete, which manifests itself as an extensive lymphatic varix; and we will now endeavour to enumerate the successive lesions that may result from this obstruction, from the thoracic duct backwards.

Chyluria. When the obstruction is central, in the thoracic duct itself or in the main trunks near it, the abdominal and pelvic lymphatics become varicose and great bunches of dilated lymphatics may surround the whole course of the urinary tract from the kidney downwards. If rupture of any of these lymphatics occurs from any cause, and especially if it be of the lymphatics in the submucous tissue in any part of the tract from the pelvis of the kidney to the neck of the bladder, chyle, with which these lymphatics are distended, will escape and be passed in the urine. This passage of milky urine, perhaps preceded by some lumbar pain, or, rarely, retention of urine from coagulation of the chyle in the

bladder, may be the first indication of filarial infection. Should retention occur the urine is subsequently passed in thin worm-like clots, often after severe pain and distress. The general appearance of chylous urine is that of dilute creamy milk, and at times it may be distinctly blood-tinged or quite red in colour, or settle with a reddish foam on the top. A more definite haematuria with large clots of blood floating in the midst of the chylous urine may occur also.

The course and prognosis of a case of chyluria are very uncertain. Sometimes it clears up only to return after an interval, perhaps of two or three months, and to disappear as unexpectedly as before. Continued chyluria causes marked anaemia, emaciation and general debility. It may come on for the first time during pregnancy or be aggravated by this condition, as further ruptures of the pelvic lymphatics occur. Exercise of any sort often induces an attack which subsides on rest; but no certain causes for the attacks of chyluria can be discovered.

Further details on chyluria and the varying appearances and composition of the urine in this condition must be studied in medical treatises. Surgically we are only interested in it as part of the chain of pathological results from filarial infection.

Treatment resolves itself into rest and elevation of the pelvis, to assist the collateral lymphatic circulation as much as possible. The general diet must be restricted and as much fatty food given as can be borne by the stomach, and in this respect cod-liver oil must be remembered. Many drugs are recommended for this condition, the usual urinary antiseptic and diuretic group, and also ichthyol and methylene blue, but it is difficult to see what effect they can possibly have. Maltine and codliver oil with chemical food, in one preparation (Kepler), is undoubtedly very useful; and iron and arsenic pills in the formula previously advised have a very powerful tonic effect. Barley water, shawwush-el-dura (ماء شواشي الدره) and Vichy (Celestins) should be the staple drinks. Finally it becomes to be essentially a matter of treating your patient as well as, or in spite of, his chyluria.

Very rarely these dilated lymphatics may burst into the peritoneal cavity or even into the intestine and give rise to *chylous ascites* or *chylous diarrhoea*. This form of ascites is usually only discovered on tapping and this is its only treatment. Chylous diarrhoea can only be treated on general principles and will persist as long as the opening in the lymphatic remains patent.

Another manifestation which frequently presents as the only evidence of filarial infection is *chylous hydrocele*, which is due to rupture of some of the dilated lymphatics in the wall of the tunica vaginalis. The swelling presents all the usual appearances of hydrocele; but is not translucent and is only discovered by tapping or on incision for a radical operation. Manson states that the fluid of chylous hydrocele usually contains enormous numbers of microfilariae, but this has not been our experience in Egypt. Large numbers of cretified adult filariae have been found in the thickened tunica vaginalis and in the epididymis in this condition. (Bahr).

It is advisable to treat these hydroceles by tapping only, when they are the only visible manifestation of filariasis, and to repeat it about every six months, rather than perform a radical operation. I think we ought to look on this effusion of fluid as a safety valve and remove it only when it becomes excessive. If anything radical is done it is possible that a lymph scrotum or even an elephantiasis of the scrotum might occur, as part of a new collateral lymphatic circulation in the skin and subcutaneous tissues.

Filarial orchitis with effusion of serum into the tunica is altogether an inflammatory condition, set up by the presence of filaria in this organ, and when painful it is best to evacuate the fluid from the distended tunica by incision and then pack it and let it slowly heal.

Lymphatic varicocele. In the Lancet of Jan. 6th, 1912, I described a series of cases, under this title, which presented all the usual clinical signs of varicocele; but we found that the swelling was due to the presence of tortuous coils of very thin-walled dilated lymphatics in the substance of the spermatic cord. This condition is almost certainly a manifestation of filariasis, a statement we were, however, unable to confirm, as there were no other lesions of that nature elsewhere, nor were any microfilariae found in the blood. In a typical case one finds the swelling to consist of a large number of coils of dilated lymphatics, having a sacculated appearance, like sausage-skins of very small calibre, and distended with clear lymph. These coils completely surround the other constituents of the cord and extend into the abdomen. The mass of lymphatics must be removed between ligatures above and below and the operation completed as though it had consisted of dilated veins. Some time after operation there had been no recurrence but, if the enlargement is due to a compensatory dilatation to provide a collateral circulation around a blocked lymphatic trunk in the pelvis or lower abdomen, the permanency of the cure is very uncertain. The contained fluid in such cases might equally well be chyle and in one case it certainly was milky. These cases occur quite distinct from any other filarial lesion in the scrotum or elsewhere, but must be classed in the same category.

It is to be noted that, in operating on large herniae or varicocele, one not infrequently finds thick white tenacious masses of coagulated lymph in and around the spermatic cord, very similar to the more organised lymphy tissue which has to be stripped off the cords in the operation for elephantiasis of the scrotum. This is probably due to exudation of lymph from increased lymph-pressure, from the weight of the hernia, in the lymphatics of the cord and surrounding connective tissue and is not filarial at all. This condition of effused lymph is quite different from the condition I have described above and is not associated with any visible dilatation of the lymphatics of the cord, subcutaneous tissues or skin.

Filarial abscesses. Abscesses, particularly about the scrotum, may occur as a result of filariasis and may sometimes be the first indication of the infection. In some cases they are due to the death of

the parent worm, which may be found entire in the cavity of the abscess or in pieces incorporated with the substance of the wall. The dead worm may, however, in many cases be entirely absorbed without producing any irritation. Most filarial abscesses occur later, from a lymphangitis which has suppurated, the process being comparable with that of an ordinary septic lymphangitis which ends in pus-formation. Such abscesses will especially occur in elephantiasis of scrotum or extremities and in glands in the groin and elsewhere, in fact, wherever attaks of lymphangitis associated with elephantoid fever are liable to occur.

In his investigations in Fiji, Bahr has found that adult filariae may be discovered in many places, and often in considerable numbers, and they may die in these situations and become cretified. Thus, he states that "in many cases adult filariae occur in large numbers in the tissues, especially in lymphatic glands and vessels, but also in other organs, as the epididymis, testis and tunica vaginalis. The adult filariae is not an unusual cause of abscess, of hydrocele, of enlarged testes, and of thickening of lymphatic vessels. . . . Whether alive or cretified the adult filariae are the direct cause of fibrosis and blocking of glands and lymphatics. Calcified filariae have been found in the interior and blocking the vasa efferentia of the epididymis." Around all areas of filarial inflammatory foci are many eosinophile cells, and eosinophilia is very constantly found in the blood in filarial infection. (Bahr).

Filarial abscesses are very rare in Egypt and are usually discovered quite by accident. Maxwell divides these abscesses into three main groups, according to their situation, as follows:—

1. In the scrotum, as suppurating hydroceles or abscesses of the spermatic cord or below the testicle.

2. In the limbs, in situations rich in lymphatic tissue along the course of the main vessels, especially in the axilla and popliteal space.

3. Intrathoracic, in the posterior mediastinum; and intra-abdominal, in the retro-peritonal tissues.

The treatment in all cases consists in free incision and drainage whenever possible.

Varicose groin glands and enlarged lymphatic glands. A distinction must be made between these two conditions. The *former* form painless soft swellings varying considerably in size, affecting one or both groins, above or below Poupart's ligament. They are frequently associated with chyluria, lymph scrotum or chylous hydrocele; and, on puncture with a fine needle, chyle or lymph may be withdrawn. Often in the fluid are found many microfilariae. The swellings may become the seat of lymphangitis and then may considerably increase in size. Throughout, however, they are soft and doughy and their size may be reduced by pressure and the recumbent position. On examination these varicose groin glands are found to consist very largely of masses of varicose lymphatics, connected with a large lymphatic varix in the pelvis and abdomen. These masses should not be removed, as, in removing them,

part of a lymphatic collateral circulation is interfered with and their excision will be followed by lymphorrhoea, by elephantiasis of the legs, or by enlarged dilated lymphatics in other parts. They are found rarely in the axilla.

Hard indurated enlarged glands may also occur. especially about the groin, but also in the epitrochlear glands and rarely elsewhere. (Bahr). These form masses consisting of enlarged and fibrosed lymphatic glands, often two or three inches in length, from which on puncture only a very small quantity of lymph can be aspirated. These hard glands in nearly every case contain live or dead adult filariae. They may sometimes form quite large, even pedunculated masses, especially below Poupart's ligament and when giving rise to any trouble may be excised like an ordinary lymphatic gland mass of other origin.

Lymph scrotum. This condition is often associated with varicose groin glands and presents as an enlarged and slightly pendulous scrotum, with a soft, smooth, silky skin, which is thickened and may contain some dilated lymphatics on the surface and from which lymph or chyle may be escaping, often in considerable amount. By friction of the clothes, or injury or inflammation of any kind, lymph scrotum very often becomes the subject of lymphangitis with elephantoid fever, which leads to its enlargement and subsequent transformation into a typical elephantiasis.

As for treatment lymph scrotum is best left alone, if possible, as it forms part of a lymphatic collateral circulation, but should it go on to elephantiasis the whole scrotum should be removed in the manner to be presently described.

Lymphangitis and elephantoid fever. At any stage in the process of filarial enlargement and thickening of lymphatics, inflammation of the lymphatic tracks may develop, with marked signs of septic lymphangitis. Fever is high and is usually preceded by a prolonged rigor. Inflammation and induration along the lymphatics with redness and congestion of the skin are prominent features. The lymph is generally sterile, but may contain micro-organisms and abscesses may form, or relief may follow the discharge of lymph from the surface of the swollen skin. A true cellulitis may develop and, in any case, recovery is incomplete and some extra thickening of the lymphatics, and induration and general swelling of the skin and subcutaneous tissues persist ; and this is further increased by each subsequent attack till it finally ends in well-marked elephantiasis, or to an increase in the size of an already established elephantiatic swelling. These attacks of fever and lymphangitis are particularly liable to arise in varicose groin glands, lymph scrotum and elephantiasis, and treatment must follow the usual lines for lymphangitis and fever from other causes.

It seems probable that some attacks of lymphangitis are due to the sudden outpouring of microfilariae by the adult worms into the tissues and the absorption of some toxic substance liberated by their destruction, which leads not only to the inflammatory disturbance but also to the death of the parent worm. (Bahr).

PLATE 28.



Fig. 1.—Lymph scrotum.



Fig. 2.—Elephantiasis of right leg and scrotum.

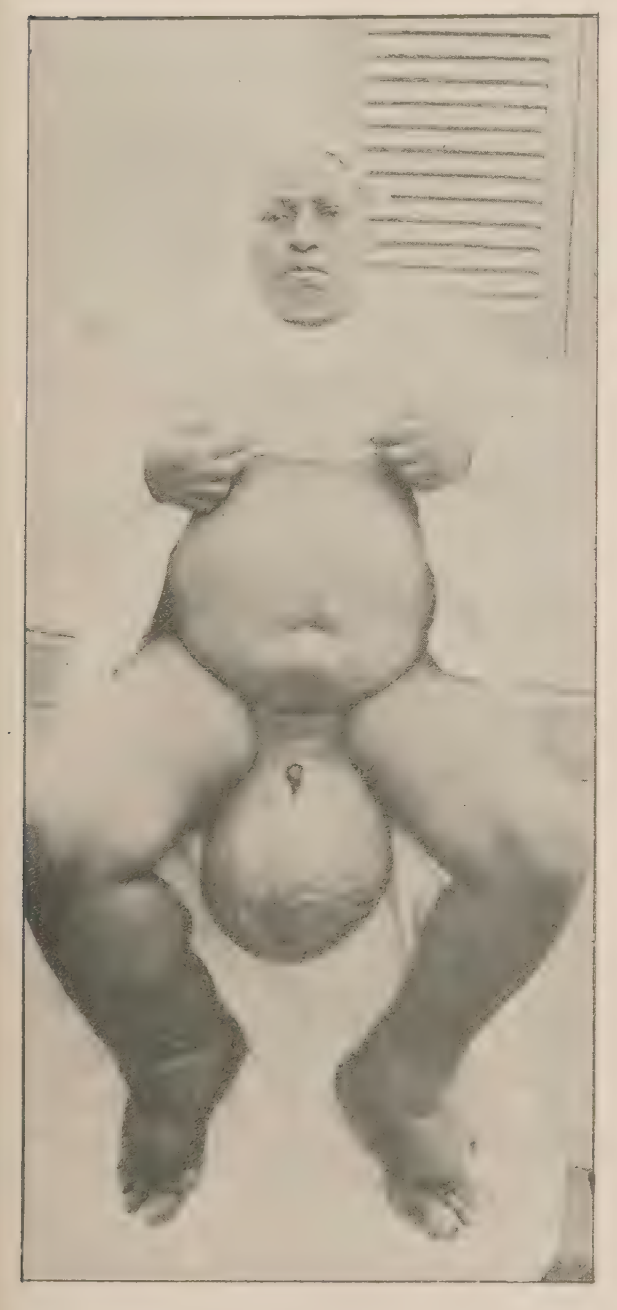


Fig. 3.—Elephantiasis of legs and scrotum, and hernia in the linea alba. P.A.



Fig. 4.—Elephantiasis of the vulva. P.A.

Elephantiasis of the scrotum and penis. Elephantiasis is by far the most common manifestation of filariasis and is very prevalent in filarial countries, especially in Cochin China and Samoa, though it has a very wide distribution. In Egypt it is fairly frequent in special districts, notably Damietta, and occurs in equal proportions in the legs and scrotum. It is probable that much more filariasis is present in Egypt than is suspected, and an investigation in the village of Kerdassah, near the Pyramids, a few years ago by Dr. Charles Todd showed that a very large proportion of the villagers harboured filaria in their blood, though only a small percentage showed evidence of elephantiasis or other filarial changes.

Elephantiasis has a special predilection for certain sites, such as the scrotum and lower extremities, but it is also met with in the arms, breasts, vulva, scalp, and in circumscribed areas in the limbs trunk and neck.

It is a natural result of the blocking of the lymph-stream, the first symptoms being usually ushered in by an attack of fever and lymphangitis. If the obstruction is sufficiently localised, the scrotum may be the part in which the lymph circulation is retarded or obstructed ; and there will be first some general enlargement, and nearly always the glands in the groin will be enlarged and hard. The scrotum will seem more pendulous and the skin too abundant, and generally softened and thickened, and either quite smooth or dotted over with tiny vesicles distended with or discharging lymph. Sooner or later an attack of lymphangitis occurs which, after subsiding, leaves the scrotum much larger and the skin much tougher and thicker. Repeated attacks of fever and lymphangitis occur, and thus, increasing in size with each attack, the scrotum may assume enormous proportions, weights of as much as 224 lbs. being reported.

As the scrotal swelling enlarges and increases in weight, it drags with it the skin of the lower part of the abdomen and as much loose skin as possible from the perinaeum buttocks and thighs. The penis, which remains firmly attached to the symphysis pubis by its suspensory ligament, is drawn out to an enormous length, the prepuce and the skin of the body of the organ being pulled down to form an elongated hood, which being buried in the mass appears as a large funnel, in the depths of which is the glans penis with the orifice of the urethra.

In a moderately severe case the enlargement of the scrotum is evenly distributed over its whole surface and, about half-way down the anterior face of the swelling, a depression, the external opening of the funnel just mentioned, presents. No trace of penis or of spermatic cords is seen nor can they be felt in the mass. The skin is thick and rough, often eczematous or even ulcerated from the constant wetness with urine, does not pit on pressure, and appears like coarse pig-skin ; the hair follicles, often much hypertrophied, standing out prominently at a considerable distance from each other, and usually tipped with thick twisted hairs, though, sometimes, the scrotum is quite bald. The consistence of the mass as a whole is soft, though the lower part is harder and more prominent that the rest, owing to thickening of the gubernaculum testis and to passive congestion at the bottom of the swelling. The fulness below is due in some instances to hydroceles. Single or double inguinal hernia may be present also.

Sometimes the scrotum alone is affected, the penis remaining quite free, but in the majority of cases of any severity the skin of the penis becomes involved in the growing mass.

When the penis alone is affected the disease shows itself first in the prepuce, (or generally in the *remains* of the prepuce, the practice of circumcision being almost universal) which becomes swollen and softened and forms a hornlike projection, or a swollen collar all round the glans penis. In time the skin of the body of the penis becomes affected also and a very characteristic appearance is produced. The essential structure of the body of the penis itself, including the glans, is not affected and in all cases it can be dissected out quite intact from the infiltrated skin and subcutaneous tissue around it, even when it is in the midst of an enormous scrotal swelling. (In *bilharziosis of the penis,* which particularly occurs in young boys, the essential lesion consists in fine multiple urethral fistulae in the anterior portion of the penis; and their presence and the inflammation and lymphatic obstruction they produce lead to a very hard chronic lymphatic-oedematous swelling—a false elephantiasis—of the *glans* penis, a condition which very rarely, if ever, occurs in elephantiasis of filarial origin.)

On section through an elephantiatic scrotum or penis it will be seen that the skin layer with all its contents is enormously hypertrophied; and that the rest of the section consists of a mass of blubbery fatty areolar and loose connective tissue, containing many large blood-vessels. The penis cords and testicles are all embedded in this milky-white tissue, which can be entirely stripped from them by careful separation in the line of cleavage. The spermatic cords are enormously lengthened and a deposit of soft fatty tissue runs up between the vessels in advanced cases, though usually there is a definite fibrous sheath enclosing the structures of the cord, which are not themselves infiltrated though much thickened. The vessels, however, are greatly increased in size and lengthened. The testicles are often enlarged, but at times are soft and sometimes much atrophied; but they may be quite healthy and are all often surrounded by large thick-walled hydroceles, containing clear fluid or, sometimes, chylous fluid or lymph, in which many embryos can be found. In the walls of the hydroceles parent worms, alive or dead, whole or broken up, and sometimes cretified, may be discovered on section.

Treatment. These swellings, however large, are not in themselves dangerous, but become very troublesome from their great weight and incapacitating effects and their dragging on adjacent areas. Complete amputation affords the only hope of relief and should be carried out when the patient's general condition permits. It should not be done if the condition of enlarged scrotum is also associated with elephantiasis of the lower extremities, as the whole area of possible lymphatic collateral circulation through the scrotum is removed and a fresh manifestation will almost certainly occur elsewhere.

When the penis alone is affected all the soft elephantiatic tissue, skin and subcutaneous tissues, must be completely removed right down to the corpora of the body of the organ by the operation of decortication. Primary or secondary Thiersch grafting must then be done.

In cases involving the scrotum and in which the penis is entirely hidden in the swelling, a deep incision must be made in the skin in the middle line from well above the symphysis pubis to the opening of the preputial funnel, and the enormous penis cleanly enucleated from the mass, as much as possible of the prepuce, if it is healthy, being left as a collar round the extremity of the penis. This skin is useful later to suture to flaps from the abdominal wall when an attempt is made to cover the penis with skin at once ; but if there is no possibility of fashioning flaps and joining them to this healthy piece of prepuce, it should be stitched back as far along the body of the penis as possible, so as to leave a smaller area of raw surface to be subsequently grafted.

When the penis is freed it is wrapped in a sterilized towel and placed on the abdomen out of harm's way, and the incision deepened through the subcutaneous tissues on either side obliquely outwards till the spermatic cord is recognised. This can be just as easily enucleated from the mass and traced down to the tunica vaginalis and testicle, which is often rather firmly fixed to the bottom of the scrotum by the thickened gubernaculum testis. This generally requires cutting with scissors ; and then the cords, with the testicles, are stripped clean of elephantiatic tissue and placed on the abdomen alongside the penis, after the hydroceles have been dealt with, either by a free excision of the sac, or by turning it inside out and fixing it with a catgut stitch behind the testicle and cord. Nothing remains below but the mass of infiltrated scrotal tissues which are to be removed. This is done by wide elliptical incisions starting behind in front of the rectum and passing round, everywhere through healthy skin, laterally to join the original central anterior incision. A catheter is placed in the bladder to protect the urethra and the whole mass cleanly removed, by deepening the incisions and dissecting away all the diseased tissues till the deep fascia and muscles are exposed throughout. Every particle of soft fat and elephantiatic tissue must be removed with almost the same care as in an amputation of the breast, the vessels, which all run towards the central point of the perinaeum, being secured with many artery forceps in the course of the dissection. Very few of these vessels will subsequently require ligatures, the pressure of the forceps and slight twisting being, in most cases, quite sufficient to stop all bleeding. If any oozing persists dressings soaked in very hot normal saline solution may be applied with pressure for a few minutes.

A new scrotum is now fashioned by undercutting the skin all round, in the perinaeum, on to the buttocks and thighs, and even on to the anterior abdominal wall. A silk-wormgut suture is inserted at the posterior end of the incision and left long and when pulled up forms the beginnings of a pouch, into which the testicles, now much reduced in size by the removal of the hydroceles, and the cords, are placed on either side. The new scrotum is completed by the suturing of the wound straight up the middle line right up to the base of the penis. A tube is inserted through lateral incisions on either side or at the rectal end of the incision, and an attempt then made to provide a skin covering for the penis by sliding skin, or making flaps from the anterior abdominal wall, and by utilising also the remains of the prepuce. It is, however, much better to leave a portion of the penis

uncovered than to run the risk of sloughing of extensive flaps in an effort to completely cover all the raw surface. Moreover, should erection occur during the course of healing, the stitches may not stand the strain and the flaps may separate if there is any tension on them. Plentiful dressing is applied and the legs kept well together until the wound is firmly healed.

If *only the scrotum is affected*, the cords and testicles are dissected out of the mass through incisions down on to them on either side and the operation completed as above.

In either case if the testicles are entirely atrophied, as from the presence of large hydroceles, they may be removed, by ligaturing the cords high up, and the skin approximated without any attempt to form a pouched scrotum. Though it frequently happens, the testes are not *always* functionless in these cases, and I have had the pleasure of being God-father to a bouncing boy conceived by one of my patients from whom I removed an enormous elephantiatic scrotum.

Elephantiasis of the legs is most usual below the knee but may develop to any extent, until the whole of one or both extremities is affected. There is a great increase in size and the skin has the usual elephantiatic characters; the nails are rough thick and deformed, and around the joints deep folds are produced, so that the articular movements are still possible. Usually, later, from the weight of the part and its unwieldiness, walking is very difficult if not altogether impossible; and, as repeated attacks of lymphangitis and elephantoid fever may supervene, the swelling goes on increasing till the limb assumes enormous proportions. In cases who can still walk the soles of the feet often become very hard and thick till they form flat hard rubber-like plates.

Treatment of elephantiasis of the legs is on the whole unsatisfactory but Castellani has reported good results from the injections of fibrolysin and firm bandaging and subsequent excision of large pieces of skin. I have done a series of cases by lymphangioplasty but with only temporary benefit, the condition becoming as bad as ever as soon as the patient began to walk about. We found that the silk threads were soon disintegrated and replaced by a cord of fibrous tissue which could not act as a new lymphatic but rather as a block to the lymphatic circulation. Sometimes the thread remained intact within a tube of fibrous tissue which was itself quite impervious and did not allow the lymph to enter it. (†)

Whatever success we have had in dealing with these cases has been by Kondoleon's operation, which consists in making long incisions through the skin and then removing a broad strip of subcutaneous tissues, including the deep fascia and the fascial covering of the muscles, so as to expose a large area of muscle. Presumably a new absorptive lymph area is thus opened up and a modified collateral circulation established. The skin incision is then sutured and the limb elevated till healing occurs. Several strips may be removed from different surfaces of the leg and foot.

(†) See British Medical Journal Nov. 2nd 1912 for paper on this subject by Madden, Aly Bey Ibrahim and Ferguson.

PLATE 29.



Fig. 1.—False elephantiasis of the right lower limb from a wound of lymphatic trunk in groin: and of the left leg from chronic ulceration. The boy has also marked mammary development.

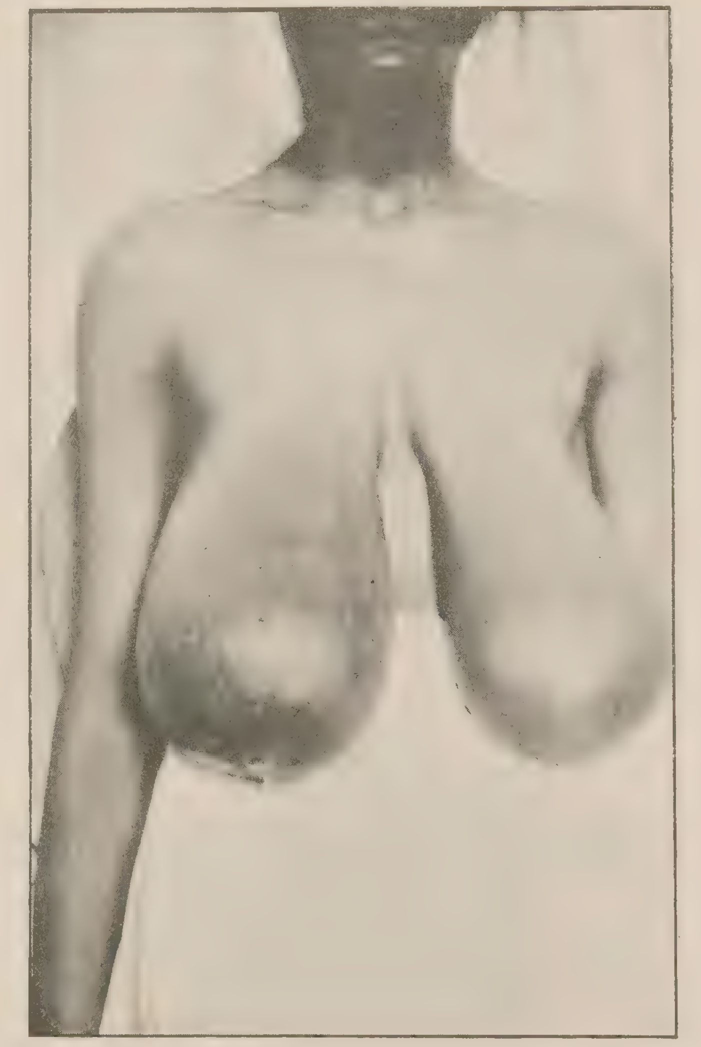


Fig. 2.—Hypertrophy of breasts. Photo: F. King.



Fig. 3.—Hypertrophy of breasts with supernumerary nipples.

Remembering the nature of the condition too much benefit must not be expected, though temporarily very considerable improvement and relief results.

In extreme cases with much disability amputation may be justified.

Elephantiasis also occurs, though very much less frequently, in the *arms*, and here it is generally associated with enlargement of the epitrochlear glands. We may also find the same condition in the *scalp, breasts* and *vulva;* and it may present as *pedunculated masses* hanging from the *groins, thigh, neck* and other parts of the skin surface. Removal by free excision must be practised whenever possible in these cases.

Filarial synovitis, especially in the knee, sometimes occurs and may even lead to ankylosis. In various parts of the body, prominent *dilated lymphatic varices* may be met with and sometimes in them the parent worm may be found. Similarly, *thickened lymphatics* may persist after an attack of filarial lymphangitis on the skin surface or in the subcutaneous tissues.

A condition sometimes known as *false elephantiasis* is sometimes found in the scrotum in cases of multiple urethral fistulae, especially in bilharziosis; or in the limbs, particularly the feet and legs, in cases of chronic inflammation from any cause. It often depends upon some deep necrosis of bone also and has nothing to do with filariasis. A careful examination must be made for thickenings of bone, openings of fistulae etc., or other evidence of chronic inflammation before a diagnosis is made. The treatment of such cases will depend entirely upon the causal condition.

The foregoing account of filariasis is largely drawn from Manson's classical descriptions of the disease in the last edition of his work on Tropical Diseases. Much of it has already appeared in the article I contributed to Choyce's System of Surgery ; and I have drawn largely also on Bahr's excellent report on Filariasis and Elephantiasis in Fiji, 1912.

XV. DISEASES OF THE NERVES.

The native Egyptian is not subject to 'nerves', nor is he commonly the victim of any of the surgical diseases of the nervous system. The presence of nerve pains in the limbs always awakens suspicions of a possible early leprosy or, in older people, of impending arterial gangrene: and a careful examination must be made of the superficial nerves for thickenings. Similar pains are sometimes associated with osteo-arthritis, especially in old women; in pellagra and other diseases of malnutrition; and in the anaemic condition due to ankylostomiasis or bilharziosis, the patient often complains of pains in the legs, which are partly neuritic in origin and may, in some cases, be the beginnings of a definite degenerative change in the spinal cord or brain so frequently associated also with advanced pellagra.

NEURALGIA is uncommon, but I have operated on three cases for severe trigeminal neuralgia, which necessitated in one the removal of the Gasserian ganglion and in the others the section of the lower divisions of the nerve as they issued from the base of the skull.

SCIATICA is comparatively common and the worst cases are those coming on after Mediterranean fever of which I have seen several examples. The fever may have been so slight as to have been hardly noticed among the many forms of fever abounding in Egypt; but it is well to make it a rule to have a Widal test made of the blood for Mediterranean fever in all cases of sciatica in Egypt. Treatment follows the usual lines but is often rendered more effective by the use of a Mediterranean fever vaccine. Colloid sulphur injections deeply into the gluteal muscles every second day are often very effective.

ISCHAEMIC PARALYSIS does not usually come under our notice till it is beyond all hope of improvement, as the majority of fractures and sprains of all kinds are treated by the local bone-setter (barsoomah) whose methods are often open to severe criticism. When a case of fracture of the forearm or humerus is firmly bound to a splint and kept there for two or three weeks it is hardly a matter of surprise to find a marked degree of ischaemic paralysis as a result.

INFANTILE PARALYSIS and the deformities it produces will be mentioned in the section on deformities.

INJURIES TO NERVES especially with fractures are sometimes seen, the most common being the musculo-spiral; but their treatment follows the usual lines and they have no special local features; nor is any other nerve, spinal, or brain condition entitled to special notice.

PLATE 30.



Fig. 1 —Leucoderma, which is particularly striking in dark-skinned people. P.A.



Fig. 2.—The same condition in a young girl. P. A.

XVI. DISEASES OF THE SKIN AND ITS APPENDAGES.

In this land of *parasites* the whole body from the hair of the head to the sole of the foot may show very active evidence of the presence of such every-day conditions as pediculosis, favus, phthiriasis, tinea in various forms, sycosis, impetigo, and the like, all of which require very vigorous and prolonged treatment if anything like a permanent cure is to be effected. The actual details of treatment do not differ from that generally adopted in more favoured climes.

In the damper summer months *prickly heat* is often very troublesome and a combination of this condition and a mixture of various parasitic lesions as well, is often included under the all-embracing title of "Ham-en-Neel" (حم النيل), a term really denoting prickly heat but at times used indiscriminately by some of the fellaheen to designate anything on the skin, from a few points of prickly heat to a general pustular eruption distributed throughout the greater part of the skin surface. The popular remedy for prickly heat and, indeed, for Ham-en-Neel in general, is a slice of water melon — bateekh بطيخ — with which the affected part is vigorously rubbed, or with an emulsion of ground termis flowers.

In the late summer and early spring BOILS and FURUNCULOSIS generally are frequently seen. They present all the usual characters of this condition elsewhere but are liable to occur in groups and to appear in many different parts of the body, particularly around the buttocks and sacrum. They are often very difficult to get rid of and nothing has any real effect upon them except a stock staphylococcus vaccine. I always use Wright's vaccines and start with 100 million and go on to 500 million and then 1000 million and increase still further if necessary. In inveterate cases an autogenous vaccine must be made. Locally, in their earlier stages they are painted with iodine and later fomented with 5 °/₀ saline or eusol solutions.

A much more virulent infection is sometimes seen giving rise to a NILE BOIL, which is essentially an acute inflammatory condition due to practically a pure culture of staphylococcus pyogenes aureus.

I have nothing to add to the description of this condition which I published in the Journal of Tropical Medicine of Oct. 1st 1906, and make no apology for quoting this paper, with slight modifications, in full.

"During the hot months and particularly in the damp weather towards the end of the summer, and also at the changes of season, residents of Egypt frequently suffer from a peculiarly painful boil (or boils) which has so many distinctive features as to justify a more detailed description than has hitherto, so far as I am aware, been devoted to it.

The European residents are probably more often attacked than the native Egyptians, though the latter are not by any means exempt. In

their case, however, the condition about to be described is included with many other pustular lesions, due to the heat and excessive sweating, in the all-embracing title of "Ham-en-Neel" which, to the native mind, is sufficiently comprehensive to connote any skin eruption from a prickly heat to a general furunculosis. Though thus almost lost sight of among its many distant relatives, true Nile Boil does occasionally occur.

A form of boil, the so-called "Bouton de Nil", next of kin to the Delhi boil, the Aleppo boil, and the Biskra button, as described by Manson, Briault, and other observers, is essentially a chronic process, and in my experience in Egypt, I have never met with such a condition, either in hospital or private practice. The boil we are accustomed to call the 'Nile Boil' is an acute inflammatory and exceedingly painful condition, which does not last more than fourteen days from beginning to end. The chronic Oriental sores above-mentioned are probably all due to infection with Leishman Donovan bodies, the main variety of which in Egypt is described as "parasitic granuloma."

As has already been mentioned, the Nile boil is particularly frequent at the end of the summer, when the river is rising or is in flood, and in the early spring, that is to say at the end of the cold season. In certain cases it occurs when the patient is much 'run down', or after one of the infectious fevers, but is just as frequently met with when he is in the rudest health. Food, drink or water do not seem to influence its occurrence, and no regime or diet appears to prevent it. One is liable to have attacks of boils at long intervals, sometimes every summer, or to have a series of boils one after the other which persist for a long time. The boils also have an unfortunate habit of developing in particularly tender places, some of their favourite seats being the perinaeum, especially all round the anus, the buttocks, the arms, the hands and the fingers, and face. They are not so common on the neck or on the lower extremities below the buttocks, though they are to be found on any part of the skin surface, and even within the external auditory meatus. They are more common in men than in women, but they are no respecters of age or sex, though, fortunately, they do not often occur in young children.

Having been myself the subject of Nile Boils on no less than four occasions, I can speak with some authority on the matter, and cannot do better than describe my feelings in detail, reinforcing my own personal reminiscences with certain additional facts I have observed in other fellow-sufferers.

One day, on accidentally rubbing my forearm with my cuff, I felt a distinctly painful point which, on close examination, I found to be a minute red spot at the base of a hair, in the hair follicle. In a few hours' time the redness was more evident and the spot was slightly raised round the base of the hair. The tenderness, even at this stage, was altogether out of proportion to the naked-eye appearances, the least friction of the shirt sleeves being quite painful. During the night I was conscious of a transient throbbing in the spot and found myself taking unusual care to place the arm in a comfortable position.

In the morning there was a red swelling the size of a sixpence, or a two piastre piece, not unlike an ordinary blind boil, which was very painful, throbbed horribly, and was acutely tender to the least touch.

The skin around the hair was dusky and was surrounded by a zone of dark red inflammation, fading off to a hyperaemic redness beyond. The central portion of the swollen lump was very hard and indurated, the indurated piece feeling as though it were let into the deeper parts of the skin. By mid-day the lump had increased in size and was even more tender than before. The surrounding inflammation had also increased in proportion. Thin, tender, red lines of inflamed lymphatics could now be seen, and there was pain above the elbow and in the axilla. A tiny blister had formed in the centre of the boil and this burst on extracting the hair and exposed beneath it the top of a pea-green-coloured slough, which was firmly attached all round to the surrounding inflamed tissues. The colour and the characters of this slough is very typical and its appearance confirms the diagnosis.

From this onwards the swelling generally increased until it reached the size of the palm of the hand, and it exhibited all degrees of acute inflammation with the green chamois-leather-like slough in the centre. The hard induration was now the size of a florin, or ten piastre piece, and the whole of the inflamed area was oedematous and pitted on pressure. The point of acutest pain was immediately around the slough.

On the fourth day a drop of thick pus was squeezed out from beside the now much enlarged slough, but without any relief whatever. The slough was still firm all round, except just at the skin surface, and gave me the idea of being screwed into the bone in the depths of the boil. The lymphangitis and the pain in the axilla increased and the lymphatic glands were enlarged and tender. The arm was absolutely useless, felt as heavy as lead, throbbed violently on any sudden movement, and could not find a comfortable place for itself anywhere.

On the fifth day, by dint of hot fomentations, the slough, which was now more yellow in colour, looked looser, and a vigorous squeeze caused the greater part of it to pop out. It looked like a partially macerated bean, and was coated with thick pus. The remains of the slough still holding on tight to the depths of the boil had to be picked out with dissecting forceps, and a small quantity of thick, slimy-looking pus was finally squeezed out. There was then left a crater-like cavity with sharply-cut though rather eaten-out edges, in the midst of a still much inflamed and indurated area of skin; but from the moment of the loosening and subsequent removal of the slough, the pain vanished as if by magic, and the part, though still hard and inflamed, was quite painless and could be handled and squeezed with impunity. Indeed, save for the redness and the crater, it was difficult to believe that a short time before one was in such severe pain.

The next morning the cavity had filled in a great deal and a little sero-pus could be squeezed out; by evening it had nearly all filled with granulation tissue and was coated with a thin layer of coagulated serum.

In two days' time the sore had quite healed, the redness had markedly diminished, and a small hard lump was all that remained of the induration. A permanent scar, covered thinly with skin, remains, or a small mass of keloid forms at the site. Throughout the whole period, up to the time of the expulsion of the slough, a very small quantity of serous discharge was found on the dressings. I have had two boils in adjoining

follicles, which, starting on different days, made the whole course of the disease longer: but, though there is a larger scar from the fusion of the two craters, the symptoms were substantially as just described. Infection of neighbouring follicles naturally frequently results. When crops of boils occur, as is sometimes the case in the perinaeum, on the loins or on the face, during the time of their acuteness the local as well as the general symptoms may be so severe as to give rise to some anxiety. I felt perfectly well in myself when the boils broke out, but by the third day I felt distinctly 'seedy', with all the usual accompaniments of fever, including a general malaise, loss of appetite, headache, sleeplessness, etc. In some cases when a large number of boils develop one after the other, the constitutional symptoms may be severe.

Professor Symmers made a culture directly from the slough, on the third day of the disease, and grew a pure culture of *Staphylococcus pyogenes aureus.*

In severe cases a spreading cellulitis may supervene; or, more usually, an abscess form just beyond the limits of the boil, and, rarely, all the more serious septic consequences may ensue."

Local treatment. In the very early stage an attempt, which it must be admitted is very rarely successful, may be made to abort the boil by extracting the hair and injecting a drop or two of pure carbolic into the reddened follicle.

Once the boil has got beyond the initial stage the hair should be extracted and hot 5 % saline or eusol fomentations, or antiseptic linseed poultices, applied and changed as often as possible. These hot applications in my experience are the only measures that afford any relief. Each time they are changed the part should be soaked in normal saline solution, as hot as can be borne, for ten minutes, before the fomentation is re-applied.

It is not the least use trying to squeeze out the slough until it is loose. It will not come out and the squeezing only increases the pain and the throbbing. Sometimes it comes out of itself on the fomentations on the fifth day. Even after its removal the fomentations are best continued for another twelve hours, after which the part may be dressed with vaseline or boracic ointment. Splints and other appliances to immobilise the inflamed parts must be used as necessary, and all complications treated as they arise.

General treatment. The only satisfactory treatment of Nile boils is by vaccines and, whenever it is possible, it should be an autogenous one, though with perseverance and increasing doses, the ordinary stock vaccines, as for boils in general, may prove quite successful.

Beyond vaccines, little is usually required in the way of general treatment, except an efficient aperient in the earlier stages, a low diet, and rest. I have tried calcium sulphide, sulphur, sulphate of magnesia, and many other drugs without any good result, nor have I seen any real effect from yeast in any form.

Once a boil has developed it is a good plan to pull out the surrounding hairs to prevent further infection, but I know of no remedy of any service as a prophylactic except a vaccine.

I would, with all respect, venture to affirm that there is a particular form of boil peculiar to this country, characterised by the intensity of its inflammation, its extraordinary and early tenderness and pain, out of all proportion to its naked-eye appearances, its characteristic slough and very scanty serous discharge, its rounded button of hard induration, and its resistance to treatment until it has run its own course, which is a distinct pathological entity depending upon the infection of the hair follicles with a pure culture of staphyloccus pyogenes aureus.

The treatment of boils, furunculosis, Nile boils, carbuncles, and all other pustular conditions of the skin is so essentially dependent upon a vaccine that it will be convenient to introduce here our experience of this form of treatment in these conditions in Egypt; and I am therefore re-printing the substance of two lectures on the subject I delivered in April 1915 to the students of the Kasr-el-Ainy and which were published in the Lancet of Aug. 7th 1915.

"It is not my intention in these lectures to enter into a detailed account of the theory of the treatment by vaccines or of their preparation; but rather to tell you of the actual results I have obtained from the systematic use of vaccines in various conditions met with in ordinary routine practice.

THE TWO KINDS OF VACCINES. In certain cases, and particularly in septic conditions and in lobar pneumonia, *stock* vaccines may be used, and I have always found the original vaccines, prepared under the direction of Sir Almroth Wright, by far the most satisfactory for general use. We are here dealing with diseases of known and definite bacteriology; and as stock vaccines are prepared from many different strains, one is almost sure to have among them that particular variety of the organism present in the lesion under treatment, and thus we secure the curative effect of its special vaccine.

In the majority of cases, however, and particularly in those of more definite etiology, an *autogenous* vaccine is to be preferred, as in its preparation the true causal organism, or group of organisms, is isolated and grown, and a more potent and direct vaccine made available.

In the present series the autogenous vaccines have all been made in the laboratory of the pathological department of the School of Medicine by Dr. Ferguson and his capable assistant, Dr. Anis Bey Onsy, who have both taken the greatest care and gone to infinite trouble to ensure their sterility and potency.

DOSAGE. On Dr. Ferguson's suggestion I have lately been starting with a comparatively small dose and rapidly increasing it until as much as 500-600 million are given at one injection. The strength of the vaccine is generally 250 million to 1 c.c. and when this is the case a start is made with 50 million. The intervals between the doses depend upon the case itself and the reaction produced, but they are never less than five days.

Practically all the vaccines are mixed and consist of the products of all the more evident organisms grown from the material collected, but with a very marked preponderance of the principal cultures. It is only very rarely that an absolutely pure culture of one organism is found.

GENERAL EFFECTS OF THE INJECTION OF VACCINE. The general effect of an appropriate vaccine is to produce a definite reaction with fever and malaise, and usually also a distinct but temporary exacerbation of the symptoms of the condition under treatment. When this degree of

reaction occurs the injections should be carried steadily on in increasing strengths at proper intervals. The maximum curative effect is generally gained in from 8-12 injections.

If no appreciable effect is produced by the first injection the dose should be considerably increased and the effect noted. If still no effect the particular vaccine may be abandoned, as no good is likely to result from its continuance. On the other hand, if a violent reaction occurs, the next injection must be postponed for a few days longer than the proper time, and the same dose, or even a smaller one, given on the next occasion. A moderate reaction should be aimed at and is a favourable sign, and indicates the continuing of the course of injections of increasing strengths.

Before concluding that a case is not amenable to further vaccine treatment fresh cultures should be taken and a new vaccine made from the predominant organisms, and this sometimes succeeds admirably. In such cases it not infrequently happens that the original organisms have disappeared, or nearly so, from the second group of cultures, and an entirely new flora is presented. This may be due to an original accidental contamination, or more generally to the dying out of the first main group as a result of treatment by its own vaccine. The second vaccine prepared under these circumstances has often an extraordinary effect in clearing up the condition. I have especially noticed this feature in coli or coliform infections of the urinary tract. In inveterate cases a third examination may be made and a vaccine prepared.

In all cases a control examination of the secretion should be made at short intervals to gauge the efficacy of the treatment and to judge its comparative effect. A considerable improvement may sometimes result from a series of injections although the examination shows still a very profuse growth of organisms. New cultures should then be made and treatment pushed with the new vaccine prepared for them.

THE DIAGNOSTIC USE OF VACCINES. Vaccines may be used diagnostically also. Thus, if a good dose of a strongly gonococcic vaccine fails to produce any reaction in a case of urethral discharge, it almost certainly means that the organism producing it is not the gonococcus. I have lately had a case of this kind under treatment in which a mixed vaccine from gonococcic, staphylococcic, and coliform bacillus cultures had no effect on the discharge, and further bacteriological examination showed an almost pure culture of a diphtheroid bacillus, with much shedding of epithelium in a whitish discharge without a single leucocyte in it.

So, also, in persistent cough, without any very definite physical signs to explain it, a stock pneumococcus vaccine sometimes has a startling effect, a clear indication that the cough is entirely a post-pneumonia condition. Conversely, when stock pneumococcic vaccines have no effect on the cough one generally finds that the respiratory flora is very profuse and diversified, and only a mass vaccine of the principal cultures is likely to have the desired effect.

TECHNIQUE OF THE INJECTIONS. Great care must be taken to ensure asepsis in the injection of the vaccine. The upper arm is generally the most convenient site. The whole area is painted with iodine and the injection made into the deeper tissues, and the needle slowly withdrawn to prevent leaking of a portion of the vaccine. The stock vaccines are put up in sealed ampoules, the autogenous usually in small bottles with a rubber cover. This cover is smeared with pure lysol, the bottle inverted, and the needle plunged into the solution through the cover. When the required quantity is taken up into the syringe the needle is withdrawn and the small hole it has made immediately closes by the elasticity of the rubber.

I have employed vaccines systematically in the following

CONDITIONS DUE TO PYOGENIC MICRO-ORGANISMS. Bacteriologically two main groups of pyogenic organisms may be differentiated, the staphylococci and the streptococci ; but it must again be insisted upon

that a mixed flora is almost invariably present and may include various forms of bacilli as well as cocci, with one family predominating. It is sometimes taught that localised lesions are staphylococcic in origin and spreading infections streptococcic; but this is only half true as I have been able to prove in one case I shall mention later, where the most virulent cellulitis from an infected wound showed practically a pure culture of staphylococcus and was rapidly controlled by the use of a staphylococcus vaccine. It must be admitted, however, that the large majority of the boil and furunculosis class of cases call for staphylococcus vaccine; and the cellulitic or erysipelatous infections require a mixed staphylococcus and streptococcus stock, as comparatively few of the rapidly spreading infections yield to a strictly streptococcic vaccine.

These remarks apply to stock vaccines only, to which most cases react, but with such a mixture of organisms it will be readily understood that an autogenous vaccine should in all cases be made whenever the means are available.

Vaccine treatment of boils and furunculosis. The most dramatic and consistently successful results from vaccine treatment are seen in the modern treatment of boils and furunculosis generally. Indeed, so universally successful has this method been in my hands that I never employ any other. In most cases, in my experience, stock vaccines if persevered with and used in sufficiently large doses, are rapidly successful. A start is made with 100 million mixed staphylococcus vaccine (Wright), followed by 500 million five days later, and at a similar interval by 1000 million. Generally this series of three injections suffices to cure the ordinary case; but in more intractable cases a further series, working rapidly up to 5000 million, will almost certainly be sufficient.

If improvement is slow or absent, even with these large doses, no further time must be wasted with stock vaccines, but a culture must be at once made from a recent lesion and an appropriate autogenous vaccine made. This rarely, if ever, fails. One commonly finds a mixed staphylococcus, aureus, albus, and citreus, the former group usually predominating and forming the major part of the vaccine. In these cases one must not be afraid to increase rapidly the strength of the vaccine, and if the reaction becomes feeble, or even negligible, and still the boils persist and come out in crops, a fresh examination must be made and an entirely new vaccine prepared. You must not be disappointed if one or even two sets of vaccines fail. Another attempt must be made and a systematic course carried out as, I must admit, I know of no other real treatment for such cases.

While the vaccine treatment is being used a simple dressing of iodine or boracic or oxygen fomentations or antiphlogistine is applied to the lesions; and some form of yeast, preferably as staphylase (Doyen) or levure de biere, administered internally. Calcium sulphide, lactate or chloride, and later a course of Easton's syrup or other similar tonic may also be prescribed.

It would be tedious to record individual cases of boils and furunculosis treated in this way, as recovery is to be expected in all cases if the treatment above described is faithfully and systematically followed. I do not remember to have had a single failure under such conditions.

A similar success generally follows this treatment in *Nile boils* which are a particularly virulent variety of boils met with in this country, and which I have described at length, from a personal experience, elsewhere. These more often provide a pure culture of staphylococcus aureus and, though sometimes rather resistant, eventually yield to the systematic course of treatment already detailed.

In both of the preceding classes of boils a stock vaccine exerts a powerful prophylactic effect for the future, and I have often insisted on what may seem to be an unnecessarily prolonged course of injections with the object of preventing recurrent attacks of boils.

Setpic conditions of the skin. Various septic conditions of the skin and lymphatics are also very amenable to stock staphylococcus vaccines. Among these are impetigo, sycosis, cutaneous erysipelas, lymphangitis, eczema with serous or purulent tendencies, quite apart from pustular acne, which will be taken in more detail later. Such cases, however, must not be blindly treated with vaccines, but other possible causes such as parasitic or syphilitic, and infectious fevers, must be first excluded before recourse is had to a stock, or, in difficult cases, to an autogenous vaccine.

I have also had some success in cases of *pyorrhoea alveolaris* with an autogenous vaccine, but in these cases it is not easy to decide which of the many organisms is responsible. In any case, vigorous local treatment must be carried out at the same time.

In *acne* generally I must admit the results have been on the whole very disappointing, the only real benefit being derived from the use of a mixed acne vaccine, the most important constituent of which is the staphylococcus albus or aureus. In non-suppurative acne I cannot remember a case in which any change for the better followed the use of the ordinary stock acne vaccine, though a temporary improvement does sometimes manifest itself when a course of the stock *mixed* acne vaccine is substituted.

Pustular acne. Comparatively recent and uncomplicated pustular acne does, however, very promptly react to the mixed acne stock in almost the same degree as an inveterate furunculosis: but in old cases, where there is much scarring about the sebaceous follicles, results are likely to be disappointing.

Local treatment by the use of sulphur lotions, washing with hot water and sulphur soap, face massage and expressing the "black-heads" as they show signs of loosening in their small bed of pus, should be persisted in, and the digestive tract well looked after. Anaemia, too, in growing girls must be treated.

The usual strength of the stock mixed acne vaccine is 10 million acne bacillus and 1000 million mixed staphylococcus. This may be used at first, but when anything like an extended course of injections is needed, or the case only slowly reacts, it is best to make use of the ordinary mixed staphylococcus vaccine, in rapidly increasing doses, as in any other skin suppuration. The result will largely depend on the amount of scarring around the follicles and the possibility of completely emptying them of secretion. It so often happens that after cure appears to be complete a fresh crop of spots appears, the bacilli having been temporarily locked up in the depths and then bursting out afresh and starting a new infection.

The worst case of this kind I had to treat was an Egyptian lady with very bad pustular acne of the face, which had come on since an attack of small-pox nine years ago. There was a great deal of pitting of the face generally and considerable scarring in the deeper layers of the skin. We made an autogenous vaccine of a very mixed composition and gradually worked her up to a dose of 300 million; and though we flattered ourselves that there was an improvement at times, the final result was very much 'as you were'. We then tried mixed phylacogen and steadily persevered with this, but with disappointing results. Face massage and regular local treatment was carried out with hot steamings, rubbing with oxygen water, and everything we could think of, both internally and externally, but without real effect. Finally the case very considerably improved, not as a result of our treatment, but rather in spite of it.

A further very important use of vaccine, preferably a mixed staphylococcus and streptococcus, is in boils, carbuncles, and cellulitis occurring in *diabetes*. These conditions are only too common in Egypt

and are so frequently fatal that every effort must be made to treat them adequately and early; and while giving first place to the adoption of the strictest possible general regime for diabetes, both in drugs and diet, a very useful ally is at hand in vaccine treatment. Here particularly one must make a practice of giving large and repeated doses of vaccines, alternating in extreme cases with anti-streptococcic serums.

Finally, as will again be referred to, many of the *urethral* infections, though occurring with or secondary to gonorrhoea, are largely due to septic organisms and many obstinate cases of urethral discharge, whether containing gonococci or not, have been entirely cured by a vaccine containing a predominance of septic organisms and a stiffening of gonococci.

Among the more purely *streptococcic* infections the results of vaccine treatment are not nearly so satisfactory, due, to some extent, to the very large area involved and the hold the disease has already got before advice is sought or the vaccine can be prepared. But there are some special conditions in which very good if not brilliant results have been obtained. Thus in erysipelas, especially while still superficial, a good streptococcic vaccine, of from 5 to 20 million, should be used as a routine measure combined with vigorous local treatment.

A mixed staphylococcus and streptococcus vaccine may also be given in cases of *cellulitis*, but here also local treatment, even to the extent of multiple incisions, must be adopted, as well as all the other measures appropriate to a general septic infection, should the temperature persist and general symptoms arise.

Even in such an appalling condition as *puerperal septicaemia* vaccines have their place among the many forms of treatment that must be employed.

Traumatic infections. Other forms of septic infection from operation wound or injury may also be very promptly controlled by vaccines; but it is very necessary to make sure of the causal organism before beginning a series of injections. A particularly good instance of the necessity for this investigation occurred in a patient on whom I operated two years ago for hernia. He was unfortunately inadequately prepared for the operation, and it transpired later, that he had just recovered from a septic, almost erysipelatous, condition of the skin in the neighbourhood of the incision. Whatever it was, three days after the operation he developed a most virulent and rapidly spreading cellulitis, extending from the wound all up the side of the abdomen and chest even into the axilla. While waiting for the culture of the organisms from the pus I injected streptococcic vaccine and anti-streptococcic serum in large quantity. Improvement was slow, but we were hardly prepared to find the culture showed an almost pure growth of staphylococcus aureus. After many incisions and full doses of staphylococcus vaccine recovery much more rapidly occurred; but about a month later two small patches of cellulitis reappeared but readily yielded to local treatment.

In all vaccine treatment it must be remembered that an incision into the affected part acts like a vaccine, as it produces a phagocytosis which will itself have a vaccinal effect, quite apart from the evacuation of pus and septic serum and the relief of tension by the incision. Care must therefore be taken not to give a strong dose of a vaccine at the same time as the incision or too violent a reaction may occur. Further, vaccine must not be given during the stage of depression, or anaphylaxis, resulting from the vaccinal effect of the incision.

In one case of deep cellulitic suppuration around the elbow, in an old lady, staphylococci and diplococci were isolated, but the resulting vaccine was not of much value, and the joint becoming involved and the bones eroded, amputation had to be performed in the middle of the arm.

I have seen good results follow the use of streptococcic vaccine in *septic throats,* though with such a diversified flora it is not possible to guarantee a successful result in all throat cases. But in general terms

the true 'septic throat' is often very greatly benefitted by vaccines: and in the absence of a diphtheria or diphtheroid bacillus, when a throat is slow in clearing up, streptococci with or without staphylococcic vaccine, should always be tried. The distinction between the various organisms that produce ordinary sore, septic, or membranous throats is very difficult to make and often involves a lengthy and elaborate process before the true causal organism can be definitely ascertained. On this account autogenous vaccines are not very practicable. A stock vaccine may possibly meet the case and should certainly be tried, though too much must not be expected of it."

CARBUNCLE occurs in about the same proportion of cases as in England and is of equal severity. Its importance, however, depends entirely on its association with diabetes and sometimes, also, with Bright's disease: and quite apart from its possibilities of a general septic infection it not infrequently proves early fatal from diabetic coma or even suppression of urine. This question has already been dealt with in the section on gangrene in diabetes, with which disease, also, boils and furunculosis and secondary cellulitis may also be complicated.

The skin lesions of LEPROSY and of PARASITIC GRANULOMA have also been dealt with in an earlier section, as also the skin lesions of BILHARZIOSIS and of SPIROCHAETOSIS.

WARTS AND CORNS are very uncommon, probably from the bare-footed habit of the people, and these and the other commoner conditions of the appendages of the skin, such as INGROWING TOENAIL and the like, have no special local significance and are treated on general principles.

MYCETOMA. Though it cannot for long be classed as a skin disease, it will be convenient to include here a description of the local manifestations of mycetoma, more especially in the form in which it most commonly presents itself, MADURA FOOT, the fungus of which gains entrance from the skin surface.

This disease was once considered to be endemic within certain well-defined limits; but of late years it has been found to have a much more extensive distribution in tropical countries than was formerly supposed. The district of Madura—in the extreme south of India—gave its name to the disease; but it occurs also in other parts of India and elsewhere in Asia. In Africa it has an even more extended locale, including Algiers, Senegambia, the Soudan, whence a few cases reach Egypt, and Reunion. Cases, apparently arising 'de novo' in the country itself, occur also in Egypt, Cyprus, Turkey, Italy, and, within the last few years, in France.

The disease runs a very chronic course and is much more common in men than in women. It generally attacks the foot, particularly in those whose occupation requires them to work bare-footed in the fields. It is only very rarely met with in a town-dweller. The condition is due to a fungus, which, though it presents some points of resemblance to Actinomycosis, is now generally regarded as a Streptothrix, which is

probably introduced by some slight scratch, wound, or abrasion of the skin, or by the thorns of certain plants, particularly of the Acacia Arabica. It is most common between the ages of 20 and 45 years, the period of greatest activity, and the usual seat of primary infection is the sole of the foot near the ball of the great toe. In this situation, or elsewhere, depending upon the site of inoculation, a rounded painless firm lump forms and slowly increases in size. As it does so it becomes discoloured and softens in the centre, eventually to break down and discharge a viscid syrupy fluid, containing some pus and at times streaks of blood, the discharge having a peculiarly offensive odour. Suspended in the discharge are a number of white yellowish-white black or pink granules, which are the characteristic features of the disease. The fluid discharged contains but few pus cells but many staphylococci. When fully developed, the raised lump presents a narrow sinus, surrounded by a button of unhealthy granulations, from which escapes a discharge with its characteristic contents. Simultaneously with the development of what may be called the primary lesion, the foot becomes swollen and gradually increases in volume in all dimensions except in length, until it eventually assumes the peculiar distended appearance characteristic of the fully-developed disease. The true structures of the foot are in time completely destroyed ; and the increase in its volume is due to the masses of fungus within it and to the formation of an unstable granulation tissue in large amount. The outlines of the foot become convex and the borders rounded off, so that its natural conformation is completely altered ; it becomes ovoid and irregularly lobulated to such an extent that all the anatomical landmarks are obliterated. The toes cannot be placed upon the ground, the foot resting on a prominent convex border, corresponding to the tread of the foot, which appears to be pushing the toes upwards. There is marked dorsi-flexion at the metatarso-phalangeal joints, the toes are fixed and diverge from each other, and often appear to be sticking out of the prominent convex border of the swollen foot. With the swelling of the foot, small rounded elevations, of varying sizes, come to be scattered irregularly over the surface of the skin. In time they undergo exactly the same series of changes as did the primary lesion, and end by discharging a fluid from a central sinus similar in characters to that already described. These mamillated tubercles increase in number as the disease progresses, and in some cases papillomatous granulations, containing cysts filled with fungus, may occur on the surface of the skin. On passing a probe into one of the sinuses it can be easily pushed in all directions through a soft fatty crumbly material, feeling almost like very soft caries, into which practically the whole structure of the foot has been converted. The passing of a probe gives rise to some oozing of dark blood and an increase in the discharge of fluid and granules. In rare instances masses of granules, more often black in colour, may be seen scattered in open spaces in and just underneath the skin, at some distance from a sinus.

With all the obvious destruction going on within the foot, sensation is still retained until a very late stage ; and there is practically no pain, nor is the skin oedematous, nor does it pit on pressure. In places there may be a sensation as of pressing on elastic metal plates (Scheube) but generally there is an elastic consistency about the affected member. The foot soon becomes quite useless, partly by its weight and deformity, but

also from the very marked wasting of the muscles of the extremity that accompanies the disease. This atrophy affects the whole limb but it is most obvious below the knee; and the extent of the swelling of the foot appears to be exaggerated by the extreme thinness of the leg from which it depends.

The nature of the *granules* discharged in the fluid from the sinuses varies. Three main varieties may be distinguished; the *white or yellowish-white*, the *black*, and the *pink*; but though these represent special pathological varieties of the disease the clinical appearances of all three forms are almost identical.

The white or yellowish-white grains, commonly compared to fishroe, are soft rounded or somewhat reniform in shape, and do not dissolve in caustic potash, alcohol, chloroform or acids; and when slightly crushed on a slide and examined microscopically, are seen to consist of a large number of granules, each granule being formed of a central reticulum of streptothrix threads with a circle of radii of very fine straight longitudinally striated filaments, some of which have distinctly club-shaped ends. These filaments run into a narrow zone of round-celled infiltration, the filaments between the cells giving an appearance of a very fine filigree edge all round. In the escape of the grains from the sinuses some small-celled infiltration always comes away and thus forms a kind of border to the specimen. The granules are connected together to form a grain by fine streptothrix threads and the size of the grain will, naturally, vary with the number of connected granules. Large masses of the fungus consist of a number of grains joined together with strepto-threads and a soft caseous-like material.

This streptothrix can be cultivated upon sterile infusions of straw or hay, in bouillon, on agar-agar, and in milk and similar media, at ordinary temperatures. It grows best at 37° C. and all growth is stopped at 40° C (Vincent). On nutrient agar-agar at first the growth was a dull-white colour; after seven days incubation at 37°C, opaque, firmly adherent to the surface of the medium, and composed of rough limpet-shaped projections. On the thirteenth day the colour changed to pale pink, deepening gradually until, by the eighteenth day, it had become a dull red-pink (smoked salmon tint), which colour the growth still, six months after inoculation, retains. Subcultures made on nutrient agar-agar showed similar growths,except that the red colour was not apparent (G. A. Williamson). The filaments in the cultures are finer than in the discharged granules and there is no clubbing. In two weeks' time ovoid spores form at the ends of the filaments. These spores are very resistant against drying and may develop after being dessicated for 21 months. In the later stages of growth, the mycelial threads become pigmented. Mycelia and spores may be stained with basic aniline dyes and by Gramm's method. This fungus differs from actinomyces, as the latter has a very definite ray-fungus appearance, does not grow on hay infusions but only on media containing albumen, can be inoculated successfully into animals, and is a facultative anaerobe.

On making a section of the foot from which the granules are obtained it cuts very easily and presents a soft, oily, degenerated surface, in which the true structure of the foot is almost entirely lost, only a few remnants of bone being left. At quite an early stage of the disease, the

PLATE 31.



Fig. 1.—Madura foot of the pink variety. P. A.



Fig. 2.—Madura foot of the white variety, with prominent raised masses around the sinuses. P. A.



Fig. 3.—Madura foot in section. The masses of black fungus are well seen. P. A.



Fig. 4.—Masses of black mycetoma running up the leg between the muscles. P. A.



Fig. 5.—Mycetoma of the hand.



Fig. 6.—Pink mycetoma in the glands of the groin. P. A.

bones may be still present but worm-eaten in an irregular manner like superficial caries. Later, the cancellous tissue of the bones becomes rarefied and filled with the same oily material as the rest of the section of the soft tissues. Lying in this pale-yellow, structureless, adipocere-like mass, fragments of tendons and fascia may still be seen, but, for the most part, it is riddled throughout with a network of sinuses and cystic cavities of various sizes, filled with masses of fungus in the midst of a caseous material. These spaces are smooth-lined, communicate freely with each other and with the sinuses and so, indirectly, with the exterior. Sometimes no definite mycotic masses are found in these spaces, their contents being an oleaginous purulent material.

Microscopically, in the earlier stages, there is an enormous round-celled infiltration around the fungus masses. Then is formed a feebly-organised granulation tissue, traversed by many new capillaries and containing many epithelioid cells and giant cells in its substance (Unna). The endothelium of the blood-vessels undergoes a marked proliferation and a kind of arteritis obliterans is the result. (Cunningham); and, generally, there is a thickening of the adventitia of the vessels (Vincent). The granulation tissue, after absorbing everything it can, softens; and spaces, which eventually become sinuses, form within it and soon reach the surface of the skin. These spaces are filled with masses of the fungus, which is also found in the tissue outside them and even in the skin itself. As Kanthack puts it:—"The microscopical cysts or abscesses consist from without inwards, of a fibrous ring, pigmented or not, granulation cells, pus cells or leucocytes, perhaps invading the fungus; a finely, granular detritus, immediately around the organism; and, finally, the fungus itself. The latter may be at any stage of degeneration."

A section through the skin nodule shows that the horny layer is intact, except at the actual point of penetration, but the deeper layers are much atrophied and the true skin is thinned, and the papillae are destroyed; in some cases even, the only covering to the degenerated tissue beneath is the horny layer.

The *black variety* is by some considered to be a degenerative form of the white, but this is probably not the case. The black grains are much larger than the white and often come away in quite large masses, like coarse gunpowder. Their colour is not discharged by alcohol or chloroform and only slightly by caustic potash; but it is discharged on boiling in caustic potash and then transferring it to distilled water. Under the microscope some of the granules show no fungus but are more like a mould, with long mycelia and with definite hyphae throughout; and these threads run into the surrounding small-celled infiltration. (Bitter).

According to Kanthack and Boyce, there may be a distinct network of interlacing broad varicose moniliform tubes with a manifest radiated appearance. At the periphery these tubes may end in minute clubs. The walls of the tubes as well as the intermediate substance are pigmented. Transition forms connecting the more or less perfect type with the structureless black masses can be traced.

The black variety has never been cultivated for certain, though Bouffard reports a red growth on sterilized maize-roots, durrah (دره),and a black one on bananas.

The section of a foot affected with the black variety of the disease differs only from that of the white form in that there are large masses of black fungus, lying within the open spaces or sinuses or even in the skin itself. These truffle-like masses are not found outside these spaces and vary in size from a pin's head to an apple.

In the *pink variety* the grains are carmine in colour or sometimes darker like terra-cotta. They are much smaller than the white grains, like minute coffee grains in shape, but their structure is precisely similar to them.

The only foot I have seen of this nature may be thus described:—On cutting into the specimen the bones of the foot were found to be in a condition of gelatinous degeneration and were hardly distinguishable from the surrounding soft tissue. The rest of the foot consisted of a mass of soft fibrous-looking tissue; and the whole cut surface was scattered throughout with very minute carmine-coloured grains. After a time the colour faded; but on cutting a fresh section, the grains again appeared quite bright in colour and freely distributed over the cut surface. The general appearance of the specimen did not at all correspond with that of the ordinary Madura foot of the white or yellow variety, the absence of cavitation being especially marked.

Diagnosis. To the initiated this does not present any difficulty and is at once confirmed by the microscopical examination of the grains discharged from the sinuses. There is, at times, a certain resemblance to elephantiasis of the foot, leprosy, tuberculous disease of the bones of the foot or of the ankle joint, but, as a rule, little difficulty is experienced in arriving at a correct diagnosis. In a recent case the appearances of Madura foot, except for the sinuses, were closely imitated by a crushed foot, which had subsequently healed with projecting toes and a solid (?) lymphatic oedema.

Course and prognosis. The course of the disease is essentially chronic, several years' history being obtained in anything like an advanced case. It is only late in the disease that the general health suffers, though for a long time the limb is absolutely useless and any exercise is impossible. In rare cases, the disease appears to stop and heals with white radiating scars on the skin surface; but such healing is only partial and temporary and any real cure does not occur. Death usually results from exhaustion or from some inter-current disease, such as diarrhoea or dysentery.

Treatment. Although various drugs, and more particularly iodide of potassium, have been tried, the only treatment of any avail is amputation well above the foot in the middle of the leg. Should there be any deposit of fungus in the section of the bones in the medullary cavity, or in the intermuscular planes, a further amputation must be done at a higher level.

The only measure of any service, from the point of view of prophylaxis, is to advise the wearing of boots ; but such advice is never likely to be followed by those who are subject to the disease.

MYCETOMA is not confined entirely to the foot. Rarely only one toe, the middle toe of the right foot (Clemow), may be affected, or localised patches may occur on the foot. Enlarged lymphatic glands containing masses of fungus in them are also found, especially in the inguinal glands and in those around the iliac vessels, and even as high up as the mesenteric glands. One of our photographs shows masses of black mycetoma in between the muscles of the leg ; and, taken in conjunction with the deposits of lymphatic glands, it would appear that extension takes place from the foot or other original site along the lymphatics.

I have reported an interesting case of *pink* mycetoma of the thigh, in which there was at first a small localised swelling, high up on the inner side of the right thigh. This gradually increased in size, and burst, leaving a number of sinuses discharging a fluid thick with pinkish-brown terracotta granules. Subsequently large abscesses formed, and, eventually, the patient died of septic absorption. Professor Symmers reported that in the right groin were numerous fistulous openings, communicating with an extensive subcutaneous cavity, which was greenish black in colour and showed drops of blue pus and numerous points of the red form of mycetoma. The bone was unaffected and the mycetoma seemed to have limited its destructive effect to the skin, subcutaneous areolar tissue, and intramuscular tissue, leaving the bone and muscles quite free. This case was probably then confined to lymphatic glands and lymphatics.

There may also be deposits in the *cancellous tissue* of bones or in the *medullary canals* of the long bones of the arms and legs. The *knee* is sometimes involved and the disease is also reported as occurring on the *abdominal wall*, on the *buttocks*, in the *hands*, the *elbow*, the *neck*, the *lower jaw* and the *face*, but never in internal organs.

The only treatment of these unusual cases is complete excision of the disease whenever possible.

Madura disease is common in the Soudan, especially in Kassala, and sometimes there is a general malignant dissemination of the disease all over the body, with masses in the glands, in the skin, on the face and elsewhere. (Gibbon).

This account of Madura foot is largely taken from Manson's Tropical Diseases, but includes also our own special local experience of the disease.

XVII. THE INCIDENCE OF CERTAIN EUROPEAN CONDITIONS IN EGYPT.

Continuing our review of Rose and Carless with special reference to the conditions which possess local interest, we now come to many diseases which require only the briefest mention, owing to their rarity in Egypt, or because they present no outstanding local peculiarity.

Thus, in connection with DISEASES OF MUSCLES TENDONS AND BURSAE the only comment we have to make is that myositis is very rare, sarcoma of muscle is not uncommon, bursitis in any form hardly ever occurs, and housemaid's knee is unknown.

For the rest the Egyptian student must be guided entirely by the record of English practice.

Similarly, in a country where the struggle for existence is always hard, a child born with any deformity has but a poor chance of surviving, if, indeed, he is not allowed to die. It is a question of the survival of the fittest and partly on this account and the rarity of rickets, DEFORMITIES are comparatively rarely seen. When, however, a true rickety deformity *is* met with, it is usually very marked and is often beyond all help from mechanical or operative procedures. Extreme deformity of the pelvis in rachitic dwarfs, necessitating a Caesarean section, is, strangely enough, frequently seen, and with, and sometimes, without it there may be a very marked rickety deformity of the lower extremities.

Congenital *talipes* is not often seen and it is perhaps more common to see various forms of talipes from old infantile paralysis, which disease is however infrequent, or from the contraction following an abscess deep in the calf, or after the cicatrix of a burn or other superficial wound. *Flat foot*, on the other hand, is decidedly common, but is generally discovered quite by accident and only very rarely complained of *per se*.

FRACTURES. Outside of hospital practice the surgeon is very seldom called in to treat a fracture, this privilege belonging almost exclusively to the native bone-setter or megubbur (مجبر), more commonly known by the name of a celebrated family, Barsoomah, in whom bone-setting has descended through many generations. The methods of this fraternity consist mainly of forcible movements, firm fixation on primitive splints, and, later, a somewhat rude and forceful massage. On the whole their results are not bad ; though in difficult situations we not infrequently see instances of malunited or ununited fractures, and sometimes a very marked degree of ischaemic paralysis.

In hospital practice, and in private also, whenever it is permitted us to take over a case, we follow all the well-accepted rules of treatment of fractures in general: treating all fractures by position, splints, and appliances, unless or until it is evident that these are not proving satisfactory, when we operate and fix the fragments, either with Lane's

PLATE 32.



Fig. 1.—Lateral curvature of the spine



Fig. 2.—Advanced rickety deformities.



Fig. 3.—Extreme rickety deformity of the tibiae, also curving and greenstick fractures of both femurs. The knees are partly hidden by the plaster of paris splints on femur.



Fig. 4.—The same patient as in Fig. 3 after operation of cuneiform osteotomy on the tibiae, able to walk with the aid of a stick.



Fig. 5.—A contrast in rickety deformities. The larger child was much improved by double osteotomy.



Fig. 1.—Genu varum due mainly to curving of the tibiae.



Fig. 2.— The same patient after operation of oblique osteotomy of tibiae.



Fig. 3.—A marked degree of talipes equinus after an abscess in the calf.



Fig. 4.—Double talipes after infantile paralysis.



Fig. 5. — Ischaemic paralysis after fracture of lower third of humerus, treated by a bone-setter.

plates or wire, as may be most effective for the particular fracture. We are very fond of Robert Jones' modifications and the original Thomas' splints and in difficult cases give extension every opportunity.

Without going into signs and treatment, it may be well to briefly mention the commoner fractures and indicate the various appliances we have found most useful. It is our custom to have an X-ray photograph taken of all cases after they have been adjusted; and to check our results from time to time by an examination with the screen or, if need be, by another photograph.

Fracture of the lower jaw, in the absence of a skilled mechanical dental surgeon, does not always receive the latest methods of treatment; but most cases do uncommonly well with the ordinary four-tailed bandage and splint, and drift into the out-patient department eventually, with very little irregularity in the line of the teeth and a firmly united bone. In cases of multiple fractures, or one in which considerable necrosis of bone has occurred, an open operation with wiring of the fragments, or wiring round sound teeth beyond the site of fracture, must be performed.

Fractures of the clavicle are generally treated by some sort of Sayre's method with strapping and bandages, but are more satisfactorily dealt with in private practice by webbing loops round the shoulders, secured behind by two straps and buckles so as to keep the shoulders well back. The arm on the affected side is placed in a sling and massage, begun quite early, to the muscles of the neck and round the shoulder, and continued throughout the treatment. When the fragment threatens to penetrate the skin, an open operation is done and the fragments fixed in position by a thin plate.

Fractures in the upper end of the humerus are treated generally without splints, by fixing the arm to the side of the chest with a good pad in the axilla, and with the elbow kept well raised. Cases of extreme deformity, whether from fracture or separation of epiphysis, are best treated by open operation with either reduction of deformity or plating. Lower down *the shaft* and sometimes, too, when quite high up, Middeldorf's triangle is often used, with or without extension, and with excellent results. The most commonly used splint is probably the ordinary internal angular, with short splints or Gooch's webbing, on the outer side. We are using Robert Jones' splints more and more for these cases, the angular one for the simpler cases without much displacement, and the straight one in cases in any part of the humerus where steady fixed extension is required. The extension may be by means of pulley and weight or by a fixed pull, the cord being firmly tied to the end of the splint.

Fractures at the *lower end* of the bone, in common with separation of epiphysis in this situation, are treated without splints by as extreme flexion as possible of the forearm on the arm.

One never hesitates to plate a fracture of the humerus in any part of the bone when the signs and an X-ray photograph show that the deformity is extreme and is not being corrected by appliances.

Implication of the musculo-spiral nerve must be dealt with as necessity arises.

Fractures of the olecranon are always wired if the patient's general condition permits of any operation. If operation is contra-indicated, a long anterior splint and early massage and movement usually give quite a good result.

If the *head of the radius* is separated completely it is best removed by operation.

Other fractures of the *bones of the forearm* are treated with anterior and posterior splints, by Robert Jones' splints, or by an internal angular with an external splint for the forearm. A posterior or an anterior angular splint will be necessary when the fracture through the radius is above the insertion of the pronator radii teres.

Colles' fracture is reduced as completely and as early as possible by Robert Jones' method: by placing the operator's corresponding hand with palm upwards under the patient's, in such a way that the scaphoid tubercle presses against the lower end of the upper fragment, and the other hand on the posterior surface of the wrist so that the scaphoid presses against the upper end of the lower fragment. By forcibly pressing his two hands together, the operator may often very effectively reduce the fracture; but if this is unsuccessful it is best to thoroughly reduce the deformity under an anaesthetic. Once it is reduced, plain anterior and posterior splints are all that are necessary; but as a matter of tradition and to some extent for comfort, a Carr's splint is generally applied. Massage, with the limb resting on the splint, may be begun three days after reduction; and, at the end of a week, massage all round the fracture may be carefully done, with the limb lifted off the splint. Very gentle passive movements of the wrist joint may be tried at the end of a fortnight; and in three weeks' time the splint may be discarded and the arm carried in a sling. The rotatory movements of the wrist may also now be started, carefully supporting the seat of fracture while so doing. The movements of the fingers are carried out almost from the beginning. The amount of use and deformity entirely depends upon the thoroughness of the original reduction of the fracture and the efficiency of the massage given, both to the seat of the fracture and the wrist. Active movements are only to be allowed when they do not give rise to pain.

Plating of one or both bones of the forearm may be necessary in cases of uncorrectable deformity, and especially in cases of delayed union or un-united fracture.

Fractures of the pelvis are unfortunately comparatively common, as might be expected from the severity of some of our accidents, and are treated by firm binders and, sometimes, plaster bands, with the knees tied

PLATE 34.

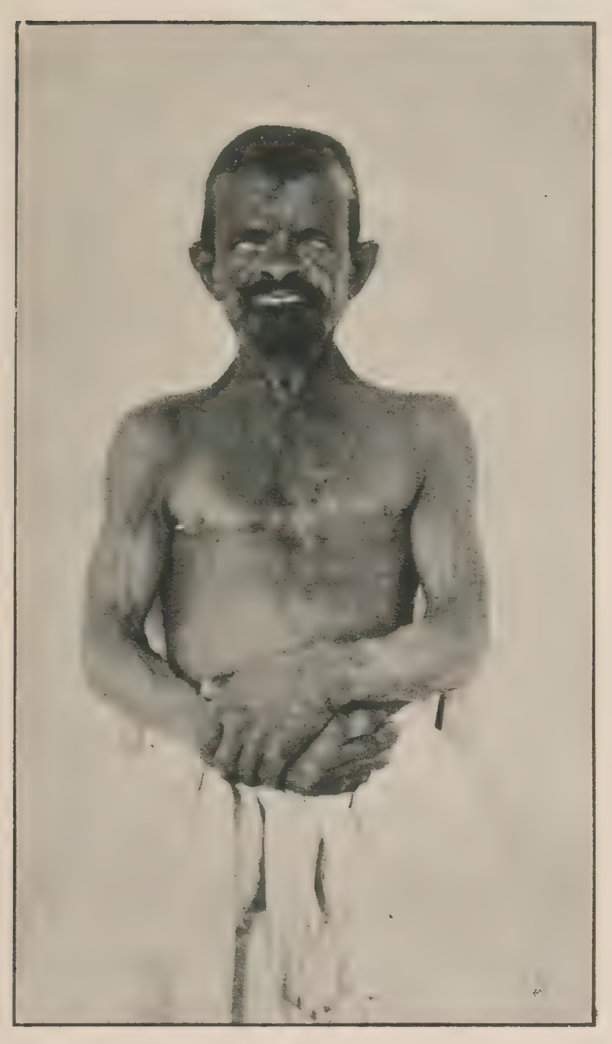


Fig. 1.—A case of congenital absence of both clavicles. Photo: Dr. Diay.



Fig. 2.—Folded up with shoulders meeting in front of the chest.



Fig. 3.—X-ray photograph of left side showing complete absence of clavicle. The same condition existed on the right side. Dr. Diay.

together, as elsewhere. Injuries to urethra and bladder are the dangerous complications and are very large factors in the prognosis. For the cystitis following on an injury to the bladder, an autogenous vaccine is most satisfactory.

Intra-capsular fractures of the neck of the femur still remain most unsatisfactory conditions to treat, owing to the old and enfeebled condition of the patient. Extension between sandbags, or on a Thomas' knee-splint, is our usual practice, with a plaster case and crutches as early as possible. What becomes of these cases, once they leave the hospital, it is impossible to say. We have never yet seen a case here, where the operation of clearing the trochanter and driving a nail through it into the neck of the bone has been justified; but quite recently we have had an excellent result after this operation in a case of a badly displaced extra-capsular fracture in a young man.

Extra-capsular fractures of the neck, and *fractures of the shaft of the femur* are dealt with by extension and Liston's, Hodgen's, and particularly Thomas' knee splint with fixed extension. In the *lower end* of the femur, Hodgen's and MacIntyre's splints are useful; and in all parts where vigorous extension is needed, especially in compound fractures, Wallace's modification of Thomas' splint sometimes does excellently. In children we frequently use a "gallows" splint with good results; and, in all parts of the bone, at all ages, we may often have to undertake the plating or wiring of fragments.

Separation of the lower epiphysis, and a *fracture* in this situation, are treated by extreme flexion of the leg on the thigh and early passive movements and massage.

Fractures of the patella are operated on whenever and as early as possible. The details of the operation will depend on the condition of the fragments, but generally the wires are passed through the fragments from side to side. Passive movements are started in ten days' time and steadily persevered in, with regular massage. In older patients, with Bright's disease, heart disease, or diabetes, an operation is not possible; and a back splint is applied, the foot well raised, and the fragments brought together as much as possible by strapping above and below. Later, a dextrine, silicate, or plaster of Paris knee-cap or a long splint is applied. Quite a satisfactory functional result generally follows, though with some permanent weakness in the knee joint.

Fracture of the bones of the leg are treated with a back splint and side splints and usually do very well, unless they are very oblique or spiral, in which case they are operated on as early as possible. Mothersole's splint, which was especially devised for the knee, is very useful in certain cases, as is also Thomas' knee splint.

Pott's fracture in its classical form is not often seen in Egypt, and Dupuytren's splint is the favourite. All fractures at the lower end of the tibia and fibula must be very carefully examined and X-rayed before and after reduction, and afterwards treated by splints and massage, with early passive movements, on general principles.

Compound fractures wherever they occur are a law unto themselves and first require the injection of tetanus antitoxin, then proper fixation of the fragments with appropriate splints, and here the metal rod splints, aluminium bars and frames, Thomas', Mothersole's, Wallace's and Hodgen's etc. have all their special use. The wound is then treated, as has already been described in the sections on wounds and septic conditions. Many cases are fixed by specially made, or interrupted splints, which often tax the ingenuity of the house surgeon to the utmost. The results usually amply repay him for all his thought and trouble in their manufacture.

In all other respects, both for recent fractures, delayed union, malunion, and un-united fractures, we have nothing to add to what is now common knowledge and is set out in detail in all modern English text-books.

The incidence of all ACUTE DISEASES OF BONE is very similar to that of Europe, though from neglect and ignorance the case often does not reach us until there is a very extensive necrosis or even implication of the adjoining joint, which in any case is generally very much contracted. In general, there is nothing essentially Egyptian about any of the different acute inflammations of bone.

CHRONIC INFLAMMATIONS are not common, probably because syphilitic bone lesions are unusual; but tuberculous disease flourishes exceedingly and is especially to be dreaded in the Soudanese, as has already been mentioned. Reference must be made to the sections on Tuberculosis and Syphilis for further details.

RICKETS is conspicuous by its comparative rarity in general hospital practice and this for two reasons. All children are breast-fed till the age of two years, whenever possible, and artificial foods are unknown among the poorer native population; and further, those who do not thrive have no chance of growing up, according to the doctrine of the survival of the fittest. We do, from time to time, come across cases of advanced rickets; but operations for knock-knee, curved tibiae, and other rickety bony deformities are not common, in either hospital or private practice. I have never seen a case of SCURVY RICKETS in an Egyptian child.

All other BONE DISEASES are as rare in Egypt as elsewhere; and, among tumours, osteomata are very uncommon, and myeloma and sarcoma — endosteal and periosteal — present no special features and are about as common here as in other countries.

INJURIES OF JOINTS. With all our accidents, sprains and the milder injuries to joints are common enough; and, after a careful examination to exclude ruptured tendons or broken bones, helped if need be by an X-ray photograph, we generally put up the part in a very large mass of wool, extending well above and below the joint, and fix it with a very firm bandage. This is left on, and even tightened, for forty eight hours. It is

PLATE 35.



Fig. 1.—Robert Jones' rectangular arm splint applied for fractured humerus in a Turkish prisoner. Photo: F. King.



Fig. 2.—The straight arm sp int applied with elevation and weight extensio...

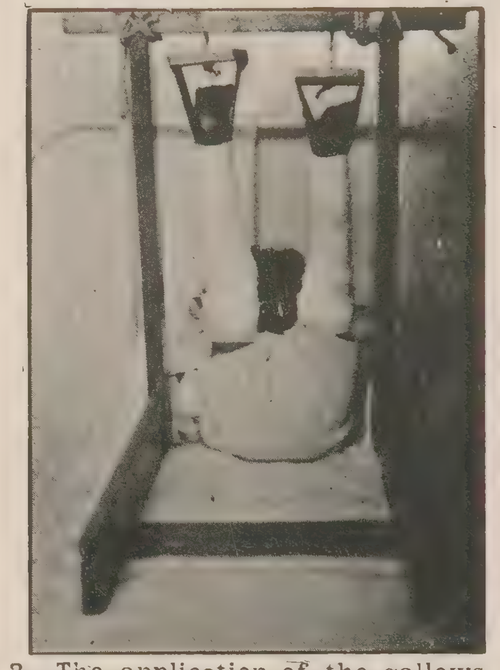


Fig. 3—The application of the gallows splint for fracture of the left femur in a child.



Fig. 4.—Thomas' knee splint as applied for fracture of the shaft of the femur. Photo: F. King.

then removed and massage is begun and continued daily and the patient allowed to move about after another mass of wool and bandage has been applied. Passive movements are only begun when they can be effected without pain; and we rely mainly, in the latter part of the treatment, on regular massage and support with an elastic woven bandage — the Ideal bandage — till perfect cure is obtained.

Penetrating wounds of the joints are treated as though they were bullet wounds — see the section on that subject — but great care is taken not to convert a wound near a joint into a perforating wound by an injudicious interference.

DISLOCATIONS on the whole are not common. Fracture is much the commoner form of injury; is this rarity of dislocations due to the fact that the fellah does not touch alcohol in any form?

Dislocation of the lower Jaw is very seldom seen. The *clavicle* is occasionally displaced at either end, and in one instance at both ends. When the sternal end cannot be replaced or retained in proper position, it is best to excise it.

Dislocation of the shoulder frequently comes to us very late and in these cases there is nothing to do except excision of the head of the humerus; and, with early massage and movement, a very good result is eventually obtained.

Similarly, such is the vogue and privilege of the "Barsoomah" that the cases of *dislocation of the elbow* we see are old and fixed, leaving us no option but to cut down and excise, may be only the head of the radius, or sometimes the upper ends of both bones. With care, massage and early movement the results are often surprisingly good. In these cases it is generally quite impossible to effect a reduction of the displacement even by open incision.

Other dislocations of the upper extremity are exceedingly rare.

Dislocations of the hip are almost curiosities. They are often associated with fracture of the head or neck of the femur and are in consequence very difficult to treat satisfactorily. Except in the rarer simple dislocations open operation should be advised in all cases.

Dislocations of the knee are hardly ever seen, except with very severe compound cases which usually require immediate amputation. The *patella* I have never seen dislocated in Egypt; and I have never operated on a case of *displaced semilunar cartillage* in an Egyptian. Dislocations of the *ankle* joint or the bones of the foot are very rare.

SURGICAL DISEASES OF JOINTS are no respecters of persons and the Egyptian suffers therefrom very frequently and but few comments are necessary.

OSTEO-ARTHRITIS rarely comes into surgical hands, but in Upper Egypt, especially between Assiout and Luxor, it is a very common

disease, and Dr. Zareef Abdulla, acting on the suggested intestinal toxaemia aetiology, has performed several colectomies with ileosigmoidostomy with very satisfactory results. Throughout Egypt it is found among the very fat hareem ladies, in whom also there is often a troublesome condition of painful fatty masses akin to adipose dolorosa.

Among the diseases of joints due to special diseases one must include DYSENTERIC ARTHRITIS which appears specially to follow the injection of certain anti-dysenteric serums; and, except in rare cases which may require aspiration or drainage, does not come within the province of the surgeon.

TUBERCULOUS DISEASE OF JOINTS has already been described and its importance and gravity must again be insisted upon, as it certainly has become one of the scourges of Egypt and is at its worst when thriving among the Soudanese.

SYPHILITIC DISEASE OF JOINTS has no great vogue and, when it does occur, other very definite signs of syphilis assist diagnosis which a Wassermann reaction will probably confirm. The latest stage of old-standing syphilis, which shows itself in the articulations as *Charcot's joints,* is comparatively frequent and is not always confined to the knee. The ankle is the next most commonly affected joint and then the elbow, and all conditions are equally unsatisfactory to treat. Amputation even well above the joints does not always do well as, from the disordered nerve supply and general poorness of the tissues, the flaps do not readily heal, indeed sometimes show a complete absence of healing reaction.

HAEMOPHILIA is almost unknown among the Egyptian; but *Ankylosis* of joints, from neglected inflammation and adhesions in the joint, from faulty treatment of fractures about the joint, and from the contraction of burns or other wounds of the skin and soft tissuses, is only too common.

The X-rays are of considerable assistance in settling the treatment to be adopted, as it is very necessary to see the condition of the articular surfaces of the bones before embarking upon a course of extension or manipulative treatment.

INJURIES OF THE SPINE are common and frequently show signs of concussion of the cord, the symptoms resembling those of a more severe injury. There is, however, no displacement of the line of the spinous processes to be felt and some degree of improvement very soon shows itself and a steady return of power follows. *Fracture-dislocation* of the spine is often seen and especially from falls from a height and from the collapse of old and unsafe houses. There is usually no doubt about the diagnosis and the treatment is very unsatisfactory and is conducted on the usual lines. Laminectomy in our hands has proved a most disappointing operation; at first the improvement appears to be considerable, but very soon the symptoms become aggravated and rapidly progress to the inevitable fatal termination.

We have quite a good share of cases of SPINA BIFIDA, both in infants and also in children of maturer age, for whom no medical aid has been sought. I have just operated on a boy of ten years of age, for what appeared to be a true meningocele with a marked hyperaesthesia over

PLATE 36.



Fig. 1.—Backward dislocation of the knee, of old standing.



Fig. 2.—Spina bifida A pure meningocele. P.A.



Fig. 3.—Sacro-coccygeal teratoma in an infant. Photo : Miss Brown.

the swelling. On operation the cauda equina was found attached to the vault of the sac. The portion of the sac to which it was attached was cut out and left attached to it and then all returned into the spinal canal. The edges of the circle of the cut sac were sutured to the margins of the dura mater covering the opening in the bones. The aponeurosis covering the erector spinae was then cut longitudinally on each side and two flaps thus formed, which were overlapped and sutured over the gap in the laminae, in much the same way as in an operation for umbilical hernia.

Provided the sac is translucent, that there is no paralysis of the legs and no hydrocephalus, and the skin over the tumour is sound, we always operate. An elliptical incision is made to remove a portion of skin and the sac is then carefully dissected out from the surrounding tissues till it is free right up to its neck, the child's head being kept well lowered throughout the operation. The neck is first ligatured by transfixion or sutured with catgut from side to side like a broad hernial sac. The sac is now cut off leaving a good collar of dura mater projecting. As little cerebro-spinal fluid is allowed to escape as possible and the operation is completed as just described, or by turning up flaps of periosteum and suturing them over the gap. Any nerves that may be attached to the sac or embedded in its walls are carefully dissected out and returned to the spinal canal before dealing with the neck of the sac.

We never attempt either the aspiration or the injection of the sac with Morton's fluid, both of which procedures are in my opinion absolutely unsound and dangerous.

Tuberculous disease of the spine – POTT'S DISEASE – has already been noticed in the section on tuberculosis.

XVIII. INJURIES TO THE HEAD.

In hospital practice in Egypt we have an extensive experience of head injuries; and as our method of treatment differs in some respects from that usually adopted I propose to describe our management of these cases, according to their several degrees of severity.

In quite recently inflicted WOUNDS OF THE SCALP generally, whether they involve the aponeurosis or not, or expose the bone, provided always there is no sign of depressed fracture, the essential part of the treatment is to keep the wound and its surroundings dry, by applying iodine freely to the wounds and all round them. The hair is cut round the wound with scissors and, if possible, the scalp shaved, alcohol being used instead of a soap lather; the wound is then carefully examined and all bleeding stopped by forceps or pressure for the moment, and the whole wound drenched by pouring iodine into it till it is full and brimming over. At the same time any pieces of hair, clot, pieces of felt or linen cap, dirt, etc. are removed and the skin all round similarly doused with iodine. If the bleeding does not stop a catgut suture is passed round the bleeding vessel and firmly tied. Then only enough silk-worm-gut sutures are inserted to approximate the edges fairly well but no attempt is made to accurately close the whole length of the wound. Before tying the sutures the wound is swabbed dry with a piece of dry sterilized gauze, but no drainage is provided. A dressing of dry sterilized cyanide gauze is applied—after the sutured wound has again been painted with iodine—and a good thickness of sterilized dressing, which is fixed firmly with a bandage.

The results are extraordinarily good and complete healing generally occurs by first intention. Tetanus antitoxin is given as a routine part of the treatment.

If a scalp wound is not seen until after *suppuration* has already occurred, it must be treated in all respects like an ordinary septic wound, and especially with eusol, as fomentations, with packing with eusol-soaked gauze, and all the measures appropriate to septic infection.

In these septic cases, and rarely, also, in recent cases *erysipelas* may occur in the wound and is a dangerous complication, owing to its liability to spread widely in the scalp and face, and also to extend into the cranial cavity by way of the communicating veins with the venous sinuses of the dura mater.

Injuries to the head may produce much extravasation of blood under the skin and frequently a definite circumscribed *haematoma*. These local injuries must be treated and looked upon as only part of the head injury in general, but may themselves require treatment. A haematoma should be left to absorb by itself, and it generally does so fairly soon, and its absorption may be assisted by aspiration under strict aseptic conditions; but, if there is any doubt whatever of a possible fracture underlying it, the haematoma must be opened very aseptically, blood and clot turned out, and the underlying bone carefully examined. The subsequent treatment will depend upon the findings; but if the bone is

intact the incision may be sutured and dressed like any other wound of the scalp, accidental or operative. But if the bone is depressed, it must be dealt with, as will be shortly described, like any other fracture of the skull of this nature.

To return to the *open wounds of the scalp,* if the bone is laid bare and a fissure fracture of the underlying bone is seen, the case is treated as though no fracture existed. But if there is any depression of the outer table of the skull, however slight, trephining should be done through the adjoining bone and the inner table carefully examined. In most cases it will be found fractured and all the pieces of broken bone must be removed and the surrounding area carefully examined with a flattened probe, to make quite sure that the dura mater is not injured and that there is no sign of pressure on it, or on the underlying brain, by fragments of bone. If the dura is torn the wound in it must be enlarged, or if it is tense and there is no pulsation of the brain present it must be incised, to examine the condition of the brain beneath it.

In all trephinings the wound should be well washed with hot normal saline solution before closing; and the soft parts are then sutured over the trephine opening in the bone. This itself is never filled with the circle of bone removed or with fragments of bone placed on the dura mater, or subsequent pressure from callus is almost sure to supervene later. Drainage by a small tube down to the dura may be required if there has been much bleeding or injury to the brain. The tube must not be kept in longer than forty eight hours or a sinus may be left and be difficult to heal, or even hernia cerebri may form.

The SEVERER INJURIES TO THE HEAD include *concussion, compression* and *cerebral irrtation or laceration,* which are very frequently associated also with fractures of either the vault or the base of the skull.

Our treatment of *fractures of the vault* is essentially practical, and, briefly, if only a fissure fracture is found or suspected, the wound, if there be one, is treated like any other scalp wound and no special notice is taken of the fracture as regards its local treatment, If there is any depression of the bone, whether simple or compound, or if it is a punctured fracture, an incision must be made or enlarged, and trephining done at once and the parts dealt with as described in the preceding paragraphs. If the depression in a simple fracture is masked by a haematoma, or we think it may be, the bone must be explored by an incision through the middle of the haematoma and treated as may be necessary. In compound fractures, and sometimes in simple cases, after incision, trephining may not be necessary, as after one loose piece of bone has been removed, the rest of the fragments can be easily picked out with forceps and the hole in the bone enlarged by rongeur forceps if necessary.

All *punctured* fractures are enlarged by trephining or rongeur forceps and then treated as a depressed fracture after operation. All such cases are always thoroughly opened up, all loose pieces of bone and foreign bodies carefully removed, and the wound washed out with hot normal saline solution and then closed, with a drainage tube, or a drain of eusol-soaked gauze, for 36 or 48 hours. If the dura is torn and the brain substance

lacerated, there is a risk of hernia cerebri and if this occurs, whether after injury or in any other condition, it is best treated by closing the wound as far as possible and making repeated small lumbar punctures to keep down the intracerebral pressure. The protruding brain may be dressed with 50 °/₀ alcohol to keep it dry and try and make it contract. It has lately been suggested in such cases to thoroughly clean the wound as above and then to pack a piece of iodoform gauze between, the bone and the dura mater all round to form adhesions, and dress the wounded patch of brain with iodoform gauze. A hernia cerebri forms in a few days and brings out with it any pieces of bone or foreign body which are then easily removed. After 2-3 weeks the hernia cerebri diminishes and becomes covered with a granulating surface. The skin flap is then dissected up again and sutured across the wound.

The *prognosis* of fractures of the vault is, on the whole, good, depending upon the extent of the local injury to the brain and the intensity of the symptoms of general cerebral injury, as evidenced by concussion, compression, or cerebral laceration. We generally expect a very large proportion of these cases to recover though sometimes with some local paralysis from destruction of brain substance. In compound cases there is always the risk of septic meningitis. During the years 1912-1913, 109 cases of fracture of the vault were admitted to Kasr-el-Ainy, and of these 83 recovered, almost axactly 80 °/₀.

The *general symptoms* associated with fractures of the vault are essentially those of concussion, compression, or cerebral irritation, which are common to all severe head injuries. Their severity varies very much with fractures of the vault. Sometimes the patient may be only temporarily stunned and hardly loses consciousness at all; whereas, in other cases, he may be deeply unconscious from compression of a large fragment of bone or effused blood. Just as much attention must be given to the proper treatment of the cerebral conditions as to the local injury of the bone, membranes, and brain, and the whole course of treatment must be conducted on proper surgical principles.

Fracture of the base of the skull is relatively common in Egypt. In the same period, 1912-13, there were 44 cases with 16 recoveries, about 33 °/₀, which I think must be a better average than elsewhere. These cases vary very considerably in severity and for the most part present signs of fracture in the middle or posterior fossa, with blood or cerebro-spinal fluid from the ear, but the escape of brain matter from any of the orifices of the skull is very rare. Cerebro-spinal fluid sometimes escapes in considerable quantity and may soak through all the dressings and pillows. In such cases it is often not even blood-stained. Blood from the ear may be quite free at first but soon stops and only discharges in very small amount after the first day or two.

The general cerebral symptoms are usually very marked and may persist for several days, and relief very often follows a free lumbar puncture, which may be repeated with benefit. At the stage of returning consciousness the patient often becomes very irritable and restless and may be quite violent and require restraint. Recovery when it does occur is slow in coming but is usually complete; and the average Egyptian fellah whose cerebral efforts rarely take him beyond the contemplation of his

PLATE 37.



Fig. 1.—Hernia cerebri after fracture of the skull.



Fig. 2.—Meningocele at root of the nose. P.A.



Fig. 3.—Meningo-encephalocele in occipita region. P. A.



Fig. 4.—Meningo-encephalocele in a baby of four months.



Fig. 5.—Pulsating cysto-sarcoma of brain with perforation of the frontal bone.

money, his crops, and his cattle, is but little affected with late mental complications. Being completely illiterate, also, he has no inducement to overwork his damaged brain by reading, or thinking over what he has read, which so often retards the complete convalescence of a more educated and intellectual patient.

The *local treatment of fractured base* is directed towards the dressing of any accompanying wounds and in keeping the ear, or other orifices from which blood is coming, clean and dry. This is done by swabbing out the external auditory canal with dry sterilized gauze and keeping it dry by frequently changing the packing. A strip of sterilized cyanide gauze may be used and then a large sterilized dressing is applied over it. If cerebro-spinal fluid is escaping, a mass of sterilized dressing must be applied over some cyanide gauze and frequently changed. The fluid stops eventually of its own accord and nothing we can do will make it stop.

The *general treatment* of all fractures of the skull, after due attention has been paid to the outward and visible signs of the injury, is that of unconsciousness generally. This has no special Egyptian peculiarities and must be studied in detail in actual practice and in English text-books.

Laceration of the brain may be produced by the depressed fragments of a fracture of the skull, but may also occur without any fracture at all and, indeed, in any severe head injury. Whenever we come across a case with concussion (which is definitely not compression) and which does not clear up in a reasonable time, we first try the effect of lumbar puncture and, failing any improvement, do trephining, as it almost certainly means that there is laceration of the brain. Generally we have some clue to the position of the injury by the presence of local paresis, or even paralysis, or, less often, a local irritation or even spasm or convulsion. Even if localising symptoms are absent a trephining should be done over the most likely place, as the decompression resulting therefrom is often of considerable benefit. The operation, wherever it is done, is always in the nature of an exploratory measure and may disclose a fracture of the skull, fissured or depressed, of the outer table; or splintering of the inner table; or the presence of bleeding or blood clot on the surface of the dura mater; blood under the dura on the surface of the brain, or actually in the brain substance; or merely increased intracranial pressure; and all or any of the conditions that may be responsible for compression of the brain. These various conditions will require appropriate treatment, quite apart from the laceration of the brain for which the operation was planned. Actually for the laceration very little can be done beyond good drainage and asepsis, with the object of inducing healing to take place without suppuration and with the least possible scarring and damage to the brain tissue.

These are the principles of treatment which must be followed also in the case of brain laceration in all fractures, whether simple or compound; but it is almost impossible to predict what will be the ultimate result, either mentally or physically, and as regards paralysis of certain parts in any of these cases.

We very rarely have to deal with *late complications of fracture* of the skull or brain injury; and find the results of trephining, removal of the

thickened bone or dura mater etc., just as uncertain and generally unsatisfactory as in other countries, though one is bound to try what operation will do rather than see a case become progressively worse.

We have nothing essentially local to add to the well-recognised principles commonly adopted for *haemorrhage within the cranial cavity*; but would point out the advisability, in all cases of uncertainty as to the source of bleeding, of exploring first the region of the middle meningeal artery and making this a centre from which further investigations may be made.

INFLAMMATION going on to SUPPURATION may and does occur in Egypt just as elsewhere and requires the same prompt and thorough treatment; and we must always be on our guard here against CEREBRO-SPINAL MENINGITIS, which, at times, is almost endemic in certain localities. While a diagnosis is being made by the examination of the fluid withdrawn by lumbar puncture, the opportunity must be taken to at once inject, through the same channel, a good dose of anti-meningococcic serum, and push it to the extreme degree of safety if the diagnosis should be definitely established. Other forms of meningitis are rare, except the septic variety, arising from some gross septic focus in the bone or the membranes or from septic thrombosis of venous sinuses, such, for example, as may originate from a very septic mastoid disease.

Similarly ABSCESS OF THE BRAIN is quite unusual and generally claims some such septic trouble as its cause and has to be tackled by appropriate operation.

Such CEREBRAL TUMOURS as we see never reach us until all hope of operative treatment is gone; and, at most, a decompression operation to some extent renders the inevitable fatal issue rather more comfortable. The difficulties of diagnosis, combined with the colossal ignorance and indifference of the patient and his friends, effectively seal his fate long before any surgical aid is even solicited.

TRAUMATIC EPILEPSY is of rare occurrence and equally rarely benefitted by operation, though we have recently had two very successful cases.

All the usual DISEASES OF THE SCALP occur here but naevus is conspicuous by its comparative absence. Similarly, such conditions as meningocele *do* present themselves, both in the occipital and in the fronto-nasal regions, but are rather pathological curiosities than objects for surgical skill, and the same is true of hydrocephalus.

The SKULL, too, is liable to the same diseases as elsewhere, though tuberculous bone disease is very uncommon in this situation.

Mention must be made of the frequency of marked DOLICHO-CEPHALIC SKULLS in modern Egyptians and its occurrence also in certain prehistoric skulls from Upper Egypt. These skulls do not give rise to any untoward symptoms but their presence must always be kept in mind or heroic operations may be proposed.

XIX. DISEASES OF THE LIPS AND JAWS.

HARE-LIP is comparatively rarely seen either in hospital or private practice. This is to some extent due to its *actual* rarity—all congenital deformities are uncommon—but largely, too, to the struggle for existence in such handicapped children proving too hard. Among the students an operation for hare lip is quite an event though when the condition does occur it does not present any special local features. CLEFT PALATE is, if possible, even more rare and I only remember operating on one case in my hospital practice.

All other developmental faults are just as rare and we only have a very occasional case of MACROCHEILIA and STRUMOUS LIP. Similarly, CRACKED LIPS from cold do not exist.

The milder degress of SYPHILITIC ULCERATION in either secondary or tertiary phases are hardly ever seen ; but we all too frequently meet with very severe destructive tertiary ulceration, both in acquired and especially in the congenital form of the disease. The whole of the upper lip, the greater part of the nose, and much of the hard and soft palate, simply does not exist ; it has all been eaten away by the very rapid and destructive ulceration, leaving only a gaping chasm, with remains of necrosed bones of the nose and face in the depths. In less severe cases there is a gummatous perforation of hard or soft palate, or both, and in such an event old scars or spreading ulcerations will be also seen in the pharynx, even extending down to the larynx and, sometimes, producing extensive destruction of the thyroid cartilage and all the soft parts within it.

A very vigorous anti-syphilitic treatment must be pursued in these cases, aided by the removal of pieces of necrosed bone by operation and thorough disinfection of the cavity by antiseptic lotions and dressings. Healing may take place by the formation of hard cicatrices at the edges but the final result, or cure, if one may call it so, is horrible in the extreme.

The commonest form of ulceration of the lip here, as in other countries, is that resulting from EPITHELIOMA. Some other aetiology than the much maligned clay pipe must be invoked as these pipes are never seen in Egypt ; but cigarette smoking is universal and often indulged in to a practically continuous extent.

Epithelioma occurs in both men and women and in both upper and lower lips, and when well-developed exhibits characteristic signs. Most cases reach us when the first question to decide is whether any operation is possible ; and if decided in the affirmative, very extensive dissections of the neck and wide removal of the lips are necessary. We always endeavour to complete the operation by a plastic modelling, from wherever skin can be best obtained, and an astonishingly good result frequently follows. Too often, however, extension to jaw, floor of mouth, and even tongue, has already occurred and, even with the best intentions, no operation is justified.

Mild syphilitic ulceration, uncommon though it be, must be excluded before operation is planned, and a careful clinical examination and, if need

be, a microscopical section will differentiate epithelioma from the condition we have described in an earlier section as GRANULOMA LABIALIS. Primary syphilitic chancre must also be excluded by its own special distinctive characters.

The TEETH of the average fellah are uncommonly good but once tartar begins to be deposited enormous masses soon form and a severe degree of pyorrhoea develops and never improves. These conditions are very much aggravated in the presence of any discharging sore or inflammation in the mouth ; and operations for their relief have often to be undertaken with the mouth in a truly filthy state. An attempt is made to improve the condition of the teeth and gums but usually with little success ; and, on this account, it has become a routine in such operations to give a prophylactic dose of pneumococcic vaccine before operation and frequently another dose very shortly afterwards.

ALVEOLAR ABSCESS and NECROSIS therefrom are comparatively uncommon : but we are not by any means exempt from an extensive necrosis of the lower jaw from acute osteomyelitis.

As already mentioned in an earlier section EPULIS of the jaw is nearly always, or becomes, malignant. The few cases of simple nature should be treated with respect and a portion of the underlying bone removed as a precaution. Reference must be made to the section on tumours for the local characteristics of TUMOURS OF THE JAWS generally.

INFLAMMATION WITHIN THE ANTRUM occurs but rarely and has its usual characteristics ; and tumours in this cavity are almost always malignant and have been already noticed.

DENTIGEROUS CYSTS are hardly ever seen and ACTINOMYCOSIS is surprisingly rare.

We have had a small series of ANKYLOSIS of the temporo-maxillary joint, some from congenital deficiency of lower jaw, others from old cicatrices around the joint, and most from some intra-articular inflammation followed by ankylosis. Treatment generally has been unsatisfactory, the best temporary result being obtained by gradually wedging the mouth open with corks of increasing sizes. In selected cases excision of the condyles may give a good range of movement.

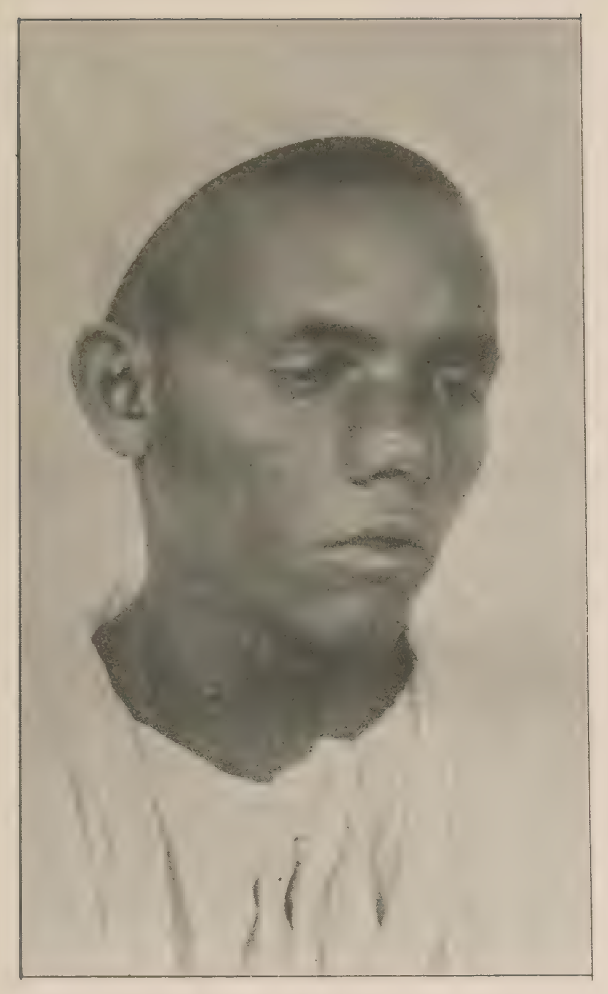


Fig. 1.—The early stage of the condition described as rhinoscleroma P.A.

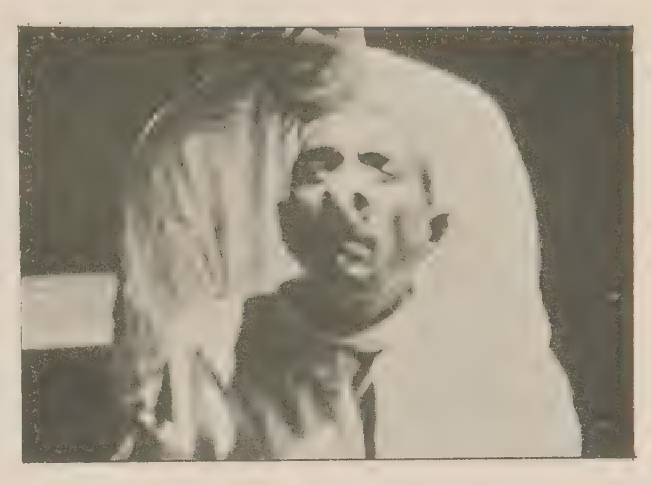


Fig. 2.—A more advanced case showing pug-nose aspect and the involvement of the nasal septum.

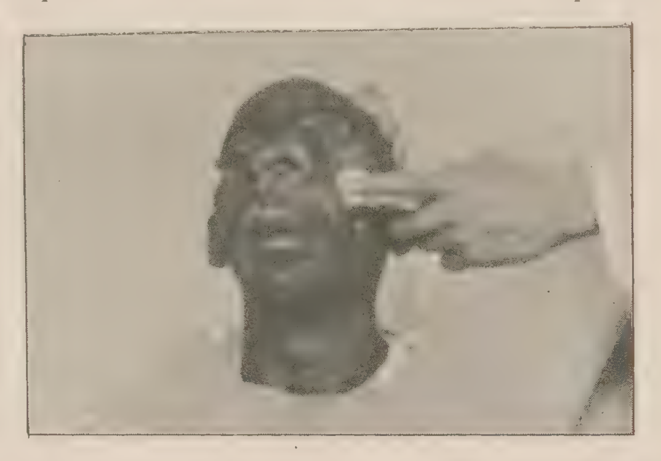


Fig. 3.—An advancing case with widening and concentric blocking of the anterior nares.



Fig. 4.—A marked case showing extension into the nasal duct.

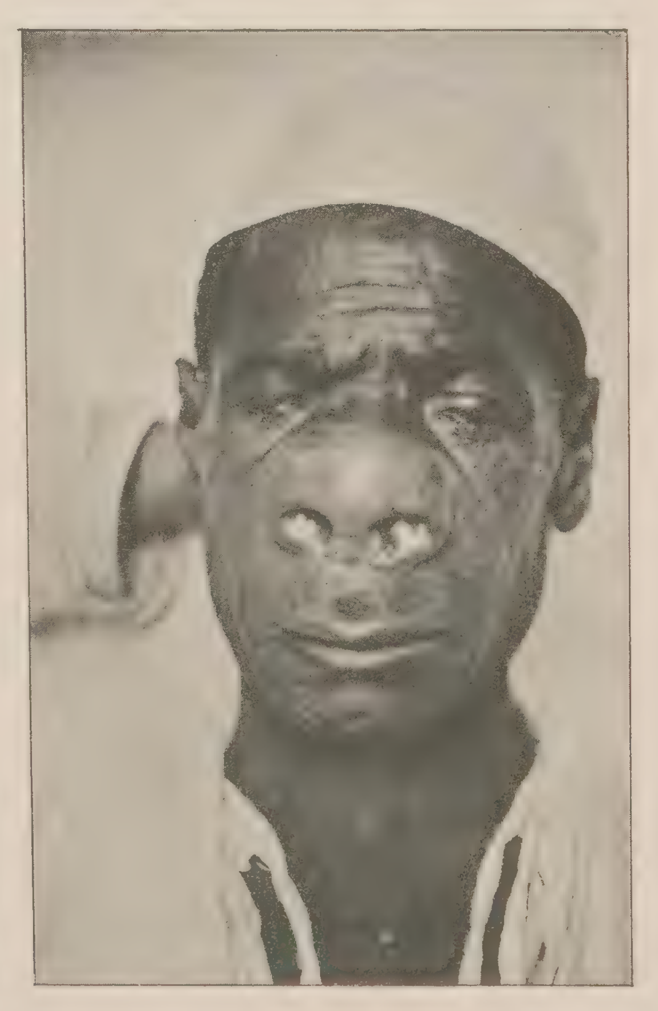


Fig. 5.— A moderately advanced case with much broadening of the nose and blocking of the anterior nares. Richards.

XX. DISEASES OF THE NOSE AND NASO-PHARYNX.

The two outstanding diseases of the nose we have to deal with in Egypt are the destructive syphilitic tertiary ulceration, already mentioned, and a peculiar form of nasal tumour akin to RHINOSCLEROMA, which has been for many years well-known and recognised, as evidenced by the old photographic print I recently discovered in the School. As far back as 1902, I published some photographs of these cases in the Journal of Tropical Medicine for June 2nd 1902; and subsequently described the condition in more detail in the Practitioner for March 1910. In deference to our pathological findings of that time and our failure to discover any micro-organisms in these cases I tentatively called them 'quiet polypoid sarcoma of the nose', but added :—"Microscopically the structure is that of a sarcoma, but it is almost incredible that, in such a well-nourished situation, there is any form of sarcoma of such a low grade of malignancy as to produce so comparatively little surrounding destruction after such a prolonged period of growth." In view of our increased knowledge in this section of pathology in recent years, there is no doubt that we were wrong in considering the growth a sarcoma. It is really a granuloma and probably of the nature of rhinoscleroma.

I have been fortunate enough to see a considerable number of these cases, and from a very early stage, and our *clinical picture* of the disease is now fairly complete.

The earliest case I remember presented a rounded firm mass on the septum, just inside the left nasal orifice and a rather smaller mass in the same situation on the other side. On excising the tumour it was found that the septum was perforated in the space between the two masses, but the rest of the nasal cavities appeared to be clear of any growth.

The above appearances are not usual, however, and in most of the early cases a firm solid-looking polypus-like mass presents into one or both anterior nares, apparently growing from the septum and not from the outer wall of the nasal meati, as is the case with an ordinary mucous or fibrous polypus. Frequently the meatus is almost quite blocked with a mass of dull-red fleshy growth. The mucous membrane over the growth and in front of it is dry and atrophic and secretes some thin muco-pus, which sometimes forms a definite crust at the anterior nares. The nose itself begins to expand and the skin over its lower half is greasy, with much enlarged sebaceous glands, and takes on a peculiar pig-skin appearance, resembling that of the skin in cancer en cuirasse. The skin is hard but still elastic at this stage and the general aspect of the nose is that of a pronounced snub nose, but without any tilting at the tip.

Its breadth is considerably increased and the very suggestive 'donkey-saddle' shape Ar. (سرج الحمار) is already very apparent. The anterior nares are expanded with the growth, and the patient is a very obvious mouth-breather. The columella is not yet thickened and, beyond the general expanded appearance of the whole nose below the nasal bones, no further extension into the nasal passages is evident. The process is essentially slow and a case such as we have just described would give a history of at least two years and probably more.

Later cases show an exaggeration of these appearances, the nose becomes tremendously flattened, and at the same time expanded, and seems to spread right across the face. The nostrils become completely occluded, and a thick hard collar of fleshy substance protrudes. The columella becomes very much thickened and prominent, a very characteristic feature in advanced cases. The skin over the broadened nose sometimes becomes hard and thick; and the whole of the upper lip may become affected and assume the same characters as that over the cartilaginous part of the nose, but the red margin of lip is unaffected. Soon a deep ulcerated crack appears inside the mouth, between the upper lip and the alveolar process of the superior maxilla, and the hard palate becomes perforated from pressure from within the nose and a large fleshy mass ultimately protrudes into the mouth. Extension has all the time been taking place backwards and the naso-pharynx is eventually blocked by masses of growth, pushing out from the posterior nares. The maxillary antrum becomes filled also and extension takes place along the nasal duct, leading to its occlusion and the presence of a hard lump under the skin below the inner canthus of the eye.

As the disease progresses, though it does so quite slowly, all sorts of pressure effects are naturally produced ; and these lead to ulceration of the skin or mucous membrane and necrosis of bones, until the condition becomes as monstrous as the photographs somewhat inadequately indicate. Throughout the whole series of cases I have never seen the red margin of the upper lip involved, though the rest of the lip may form a much thickened solid plaque extending to each angle of the mouth. In my original paper I also reported two cases in which the main feature of the disease was a fungating ulceration of the anterior portion of the nose and front of the hard palate. Sections from these cases were undoubtedly sarcomatous, but I am now doubtful if they really were cases of the kind we are describing. They were comparatively rapid in their growth, and at the operation I was able to remove the whole mass by a very free skin removal and excision of the whole nose in front of the nasal bones. In neither case was the red margin of the lip involved and in one the operation necessitated the removal of the greater part of the hard palate, It may be that these were cases of rhinoscleroma in which ulceration, originating in an external injury, had progressed apace and led to their extensive destruction, but their appearances were not such as to justify their inclusion with the cases we are considering, in the improved state of our knowledge.

It is hardly necessary to add that no surgical *treatment* is of any avail, except it be an attempt to clear the nostrils at quite the earlier stages of the disease, and the possible temporary introduction of small tubes to keep the air-way open.

The *pathology* of the disease is essentially that of a granuloma ; and in several cases Ferguson has succeeded in finding organisms in the depth of the growth which very much resemble, if they are not actually, those of rhinoscleroma. It is quite certain that our original idea of sarcoma must be abandoned in favour of granuloma, which we now know may depend on so many varieties of organisms or other parasitic agents. Ulceration is common to other granulomatous growths in advanced cases and these may even end in sarcoma.

PLATE 39.



Fig. 1.—A case of well defined rhinoscleroma taken in 1902. P.A.



Fig. 2. — The same case taken seven years later. P. A.



Fig. 3.—Side view of same case as in Fig. 2.



Fig. 4.—A very advanced case of rhinoscleroma. The 'hippopotamus man.' P. A.

My colleague Richards, writing many years later and apparently without knowing of my earlier publications, reported some of these cases at a meeting of the British Medical Association in 1913 in a paper entitled "Rhinoscleroma"; and as he looks at the disease from a more recent and rather different standpoint, I propose to include the greater part of his communication in this section. He writes:—

"The disease begins as a localised hard papule in some part of the nose, and, in the course of a year or two, this induration spreads till it involves practically the whole nose, and frequently the upper lip and palate as well. One of the most striking features about it is that it infiltrates the whole nose more or less symetrically without destroying its essential form; the nose may be many times its natural size and, owing to secondary ulceration, it may resemble a malignant growth of the face. But, nevertheless, even in such advanced cases, its alae and septum can be distinguished; and it is evident that we are dealing with a diseased nose and not with a growth replacing it. This distinguishes it at once from any form of malignant disease.

The actual growth seems to be a granuloma of the subcutaneous and submucous tissues and the skin and mucous membrane are for a long time unaffected. Later, as the mass increases in size, they become fixed to the deep tissues and develop a shiny surface, followed by an eczematous reddening which progresses ultimately to ulceration. But, long after the nose has become quite deformed, it continues to be covered with apparently normal skin outside and with a pale-grey intact mucosa inside. The narrowing of the nasal passages, except where the septum is first and severely affected, is usually concentric, in accordance with the symmetrical development of the swelling mentioned above.

The growth is hard but of the hardness of cartilage rather than that of wood; it is fairly vascular and seems never to soften and break down. Extension commonly takes place into the upper lip and not infrequently into the palate. The lachrymal ducts also become blocked and, from the occurrence of deafness, one may assume that the Eustachian tubes are also obstructed.

Further than this it does not seem to go, the jaws and face appear to be able to resist attack even when the nasal mass becomes very large indeed. The bones of the palate, and the alveolus near the central upper incisors, may become absorbed to some extent, but probably rather from pressure than actual invasion.

Any moderately advanced case is quite easy to diagnose, and the characteristic bacillus has been found in the deeper layers in all cases in which it has been looked for. . . . . The only prospect of cure seems to lie in attacking the active cause of the disease and trusting to Nature to absorb the mass. In all probability the cause is a living parasite. Granulomatous masses under the skin or mucous membrane occur very commonly in this country from infection with bilharzia and Leishmania. Since rhinoscleroma is clearly not malignant it is probably one of the parasitic granulomata. The fact that a specific bacillus is constantly present in the deeper layers suggests, though it does not prove, that this is the real cause of the disease; and vaccine treatment was undertaken on this hypothesis."

Dr. Ferguson and Dr. Anis Bey Onsy examined these cases and prepared a vaccine as follows:—

"As a rule the isolation of the characteristic bacillus offers no difficulty. The surface of the mass is first rigorously treated to remove superficial bacteria, chiefly staphylococci and diplococci. If a platinum loop be introduced within the edges of a minute incision, 3 or 4 mm. deep, if the infiltration and the blood which fills the loop be stroked over the surface of several agar tubes, a glutinous growth of the bacillus of rhinoscleroma will, as a rule, be obtained in one or more tubes. The more

certain method, however, is to remove a small piece of the tissue after having made its surface sterile, and smear the fresh-cut surfaces over one or two ordinary agar plates. The hemispherical, moist, sticky, greyish colonies of the rhinoscleroma organisms are easily picked out,after twenty four hours incubation, from other growths of pneumococcus, diplococcus catarrhalis and diphtheroid organisms. Sloped agar cultures of the rhinoscleroma colonies are then made, the purity of the colonies and the morphological characters of the organisms being confirmed by stained preparations. Vigorous superficial growths were obtained after twenty hours incubation. 5 c. cm. of sterile normal saline were placed on each culture and an emulsion as homogeneous as possible was made by means of a fine glass rod. This bacterial emulsion was transferred to a sterile test tube containing glass beads. The tube was drawn out and sealed in the flame and the emulsion thoroughly agitated for forty-five minutes. This prolonged agitation was found necessary, owing to the well-known viscid nature of the rhinoscleroma growth. When a satisfactory emulsion had been obtained, the drawn out end of the tube was filed and broken, a few drops of the emulsion withdrawn, and the bacteria contained in 1 c.c. estimated by Wright's method by comparison with the observer's known red corpuscles. Suitable dilutions of the vaccine were then made and delivered for administration."

(I have included the details of preparation of this vaccine for the benefit of students, and those who have not had much experience in such methods, but it even then does not give any idea of the care and accuracy that must always be exercised in the preparation of such delicate but powerful injections.)

"The vaccine thus prepared was injected, in doses varying from 1 to 20,000 millions into a series of four patients and an attempt was made, by exposing the nose to the sun and by hot applications, to increase the circulation in it. None of the cases showed any local reaction or more than a slight rise of temperature, and indicate that vaccine treatment with the bacillus in question is useless, either because the body does not respond to the vaccine, or the bacillus is not the real cause. Surgery is equally useless, except possibly in the very early cases; and, unless some help is forthcoming from the pathological or chemical side, the disease must be considered as incapable of either cure or alleviation."

A consideration of the photographs and these two independent descriptions of the disease will suffice to make this condition quite clear; and to put you on your guard when these extraordinary cases are brought to your notice.

Other diseases of the nose have no special local peculiarities; but there appears to be a larger proportion of large fibrous NASOPHARYNGEAL TUMOURS, which often grow to an enormous size, than elsewhere. Large as the tumours often are they are not always beyond operation and Dr. Hassan Shaheen, Surgeon to the Throat Department, has had a remarkably successful series of such cases.

ADENOIDS are only found in a comparatively small proportion of children and present no peculiarities of interest.

PLATE 40.



Fig. 1—Side view of the hippopotamus man, showing the ulceration through the skin and the enormous general expansion of the nose. P.A.



Fig. 2.—A similar case from a very old photograph in the Medical School.



Fig. 3.—The fungating form of the disease ending in sarcoma. P.A.



Fig. 4.—The same condition in a young girl. Both this case and the preceding were treated by complete excision. P. A.

XXI. DISEASES OF THE MOUTH, THROAT AND OESOPHAGUS.

From a combination of neglect and ignorance, the mouth of the growing child is often allowed to get into a very dirty condition; and in enfeebled children an awful degree of apthous STOMATITIS develops, first on the tongue, but soon extending to the rest of the mouth. Becoming more and more septic the gums are soon involved and the final state is that of a filthy gangrenous stomatitis for which treatment, mainly on account of the child's general feebleness, is of little avail.

In such children, too, CANCRUM ORIS is very prone to occur and enormous destruction of the cheeks lips and mouth generally results. Nothing can be done in most cases as the gangrenous extension is so virulent and rapid; but occasionally an early free excision of the gangrenous area may prove succesful in checking the process, and subsequently some form of plastic operation is performed.

CONGENITAL DEFORMITIES OF THE TONGUE and the various forms of GLOSSITIS are very uncommon and we only very seldom see anything approaching the elsewhere well-known syphilitic leucoplakia.

Other SYPHILITIC manifestations on the tongue do not occur nearly so commonly as in England; and many a so-called tertiary ulceration has been proved on microscopical examination to be a true epithelioma. It is our practice, however, to submit all such cases to a Wassermann reaction as well, and many doubtful cases are sometimes thus differentiated. Sometimes an epithelioma is grafted on to a syphilitic ulceration, in which case considerable improvement may take place by the adoption of anti-syphilitic remedies, and the operation is subsequently done under more favourable conditions.

The general incidence and treatment of CANCER OF THE TONGUE has been already dealt with in the section on malignant tumours.

RANULA is common and is often of great size. Moderate cases present mainly into the floor of the mouth; but the very large ones form a prominent bulging in the neck under the lower jaw with hardly more than a fulness in the mouth. There may be quite large DERMOID cysts in this situation also. Whenever possible, the operation is done through the mouth and as much of the roof of the cyst removed as possible; but when necessary to make the incision in the neck, a free opening is made through skin deep fascia and platysma, after which the mylo-hyoid is retracted at both sides, and a very free removal of the cyst wall effected. It may be necessary to open into the floor of the mouth, in which case a drain of eusol-soaked gauze is placed right through from the neck into the mouth, and the wound allowed slowly to granulate up. When the cyst wall can be completely removed, the wound may be closed at once, or left with a small tube for forty eight hours.

We have nothing to record of special local interest among DISEASES OF THE SALIVARY GLANDS or PALATE, except to again mention the extreme rarity of cleft palate.

Nor need we be detained by DISEASES OF THE TONSILS, which are the same all the world over; though chronically enlarged hypertrophied tonsils are comparatively uncommon.

All forms of STRICTURE OF THE OESOPHAGUS are so rare as to make them quite a special event. The value of the Wassermann reaction must never be forgotten in the diagnosis of doubtful cases of oesophageal obstruction. A recent case of supposed malignant stricture of the oesophagus gave a positive Wassermann; and, after kharsivan and a course of iodide, celebrated her escape from gastrostomy and demonstrated her improved swallowing capacity by drinking off a nutrient enema that had been prepared for her and had been incautiously left beside her bed.

XXII. DISEASES OF THE EAR AND THE NECK

In connection with DISEASES OF THE EAR we have only to point out that, as might be anticipated from the comparative rarity of enlarged tonsils and adenoids, middle ear disease with its persistent OTORRHOEA is not nearly so frequent in Egypt as elsewhere. Cases of MASTOID DISEASE are fairly common and are liable to the same complications and dangers as in England. In this and in all other ear diseases, it is not necessary to do more than refer the reader for all that is required to a good English text-book.

Concerning DISEASES OF THE NECK, it must be remarked that, after excluding the glandular group of diseases, which have been dealt with in earlier sections, there is nothing to add of local interest. Of the CYSTS of the neck of congenital origin, ordinary dermoids and cystic hygroma are very rare; but cysts in the remains of the thyro-glossal duct are comparatively frequent, especially in the portion of the unobliterated duct below the hyoid bone. Of the acquired cysts, the only cystic swellings at all common are cold abscesses, ranula, and small cysts in connection with salivary glands. All other kinds are curiosities.

I have never seen a case of *cut throat* in this country. Suicide is not fashionable and when it is practised the average Egyptian prefers to swallow something or shoot himself rather than to effect any such self-mutilation as cut throat entails.

GOITRE. The *simple forms* of goitre are fairly common in Egypt, particularly in Upper Egypt, and we have an average of twenty cases admitted to hospital each year for operation. These are nearly all cases of general parenchymatous enlargement, usually affecting one lobe and isthmus; though, in practically all cases, the three parts of the gland are involved and sometimes all parts equally and to an enormous extent. Cases in which a definite cyst-cysto-adenoma occurs in the substance of the gland are quite rare; but occasionally a cyst may be found in the isthmus, which is sometimes really due to the non-obliteration of the terminal thyroid portion of the thyro-glossal duct.

In simple cases of goitre any severe degree of pressure symptoms is uncommon, except a slowly progressive pressure on the trachea from each side which may eventually result in the production of a scabbard trachea. There may also be some signs of pressure on the brachial plexus in large goitres. Operation is generally performed on account of a regular increase in size and the failure of any form of medical treatment to influence this increasing swelling. The only really troublesome symptom may be a growing breathlessness on exertion.

In *malignant* cases, pressure symptoms develop quite early and rapidly become worse, to a degree quite disproportionate to the amount of visible increase in size; and whenever the superficial veins of the neck are dilated in a case of goitre, it is more than suspicious of malignancy. Such cases start insidiously, then begin to grow rapidly, are often very

fixed from the beginning and are much harder than the ordinary goitre. The growing mass becomes irregular in shape, the superficial veins become very much enlarged, and the growth becomes firmly fixed to every structure in the neck. The trachea is pushed aside, rather than constricted by external pressure, and at late stages may be infiltrated with growth. Enlarged hard glands may be felt deep in the neck; and secondary growths, in the sternal end of the clavicle, on the skull, and in other parts of the body and viscera, may appear at any time. Both sarcoma and carcinoma are met with and they are equally rapid and dangerous. From ignorance of the danger and indifference, late cases of malignant goitre are only too commonly seen here, especially in men, and with but little hope of successful treatment.

We have nothing interesting to add of special local bearing on the *signs and symptoms* of an ordinary goitre; and, from the scattered distribution of the disease, in spite of the universal drinking of Nile water, we cannot contribute anything to the elucidation of the problem of the causation of goitre, which is now being so closely investigated by McGarrison and Farrant.

There are several important points to be noticed in the *operation* for goitre, and it will be well to describe our practice in this respect in some detail.

As a rule, chloroform is used as the anaesthetic. A preliminary injection of morphia or scopolamine is of considerable benefit and much reduces the amount of chloroform required. Local anaesthesia may also be employed after a preliminary injection of morphine and atropine, or scopolamine, and often proves very successful if properly induced.

With strictest aseptic preparations the neck is put slightly on the stretch, by placing a small pillow under it, and a free cut-throat incision made from the outer border of one sterno-mastoid to the same point on the other side, about the level of the cricoid cartilage and not too low down in the neck or the resulting scar will lie in a bad position. Skin flaps are dissected up and down till the whole goitre is thoroughly exposed. The platysma and the cervical fascia are then divided in the line of the original incision, and the superficial veins secured with forceps, before they are divided, as far as possible. The greatest care must be taken to secure any vessel that is cut or is bleeding, or may bleed, not only now but at every stage of the operation. Whenever possible the vessels should be caught first and then divided between two pairs of forceps. This prevents any unnecessary bleeding during the operation and minimises the risk of any haemorrhage after it. The sterno-thyroid and sterno-hyoid muscles are next divided transversely and when this is done, and the deep cervical fascia behind them, which forms the real capsule of the thyroid, incised, the thyroid mass is exposed and can be easily enucleated with the finger from its surroundings. It is worse than useless to attempt to shell out a thyroid until this stage has been reached; and equally important not to cut through the true capsule of the gland or severe bleeding will ensue.

PLATE 41.



Fig. 1. -Cancrum oris.

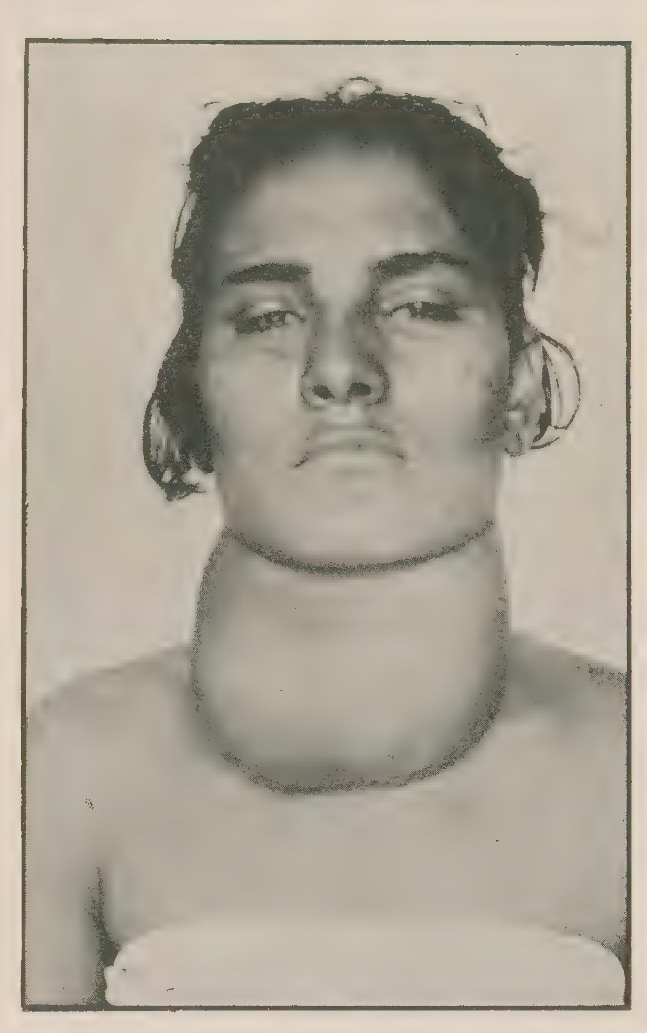


Fig. 2.—General parenchymatous goitre. P.A.



Fig. 3.—Cysto-adenoma of all parts of the thyroid. Patient died, several weeks after partial thyroidectomy, of tetany of the larynx. P.A.



Fig. 4.—Cysto-adenoma of the isthmus of the thyroid. Patient died, three days after removal of isthmus, of acute thyroidism. P. A.

In most cases the selected lateral lobe can be easily shelled out and delivered from the wound, being held only by the vessels. The upper pole is generally cleared first and when the actual vessels are well defined and isolated, by the use of a metal dissector for choice, the vessels are divided between two forceps, and the middle thyroid veins if they exist, similarly divided. The separation of the gland from the underlying structures now proceeds and usually in the direction of the isthmus, and then the lower pole of the lateral lobe is cleared and the inferior thyroid vessels secured and divided between forceps. This is not always easy but is very necessary to effect satisfactorily or deep bleeding may occur and cause a lot of trouble low down in the neck. By keeping close to the glandular pole and seeing that nothing but the vessels are included in the bite of the forceps no further trouble or nerve injury need be anticipated. The gland does not often run down behind the sternum here.

The lobe and isthmus are now carefully dissected off the trachea and the greatest care taken to avoid injury to the recurrent laryngeal and nerves of any kind. If the isthmus is to be left, it is first crushed in a Kocher's forceps, ligatured, and cut through just at its junction with the lateral lobe. Any bleeding points in and around the stump are caught with forceps and subsequently ligatured. Other portions of the thyroid may require to be removed and all bleeding points from the cut surfaces must be carefully ligatured and the whole area of operation left quite dry of any bleeding or oozing. After every cut vessel has been ligatured, the wound is well washed out with hot normal saline solution, both to stop any oozing and to wash away any thyroid secretion. The divided sterno-thyroid and sterno-hyoid muscles are well sutured, if their edges come together without any tension, and a tube is then inserted into the depths of the wound and the skin closed entirely with clips. The tube may be brought out through the middle of the wound or, preferably, through a small vertical stab below the original incision in the middle line. A tube should be inserted in all cases of removal of a portion of the thyroid to drain off the serum, which usually exudes in considerable quantity, and also to allow of the escape of the thyroid secretion that may flow into the wound from the cut surface of the gland. The tube is removed in at most forty-eight hours. A firm bandage over a large mass of dressing is applied and this may require changing the following morning, as discharge of serum is often very copious.

The only real *danger* after this sometimes formidable operation is haemorrhage, which should be entirely prevented by taking the greatest care to stop any sign of bleeding before the wound is closed. If the vessels are divided between two pairs of forceps, as they are encountered, very little bleeding will occur, either at the time or subsequently; though, from the slipping of a ligature, it may be a very dangerous complication, even necessitating the complete re-opening of the wound and a search for the bleeding point.

Two other complications have to do with the thyroid secretion and are due either to an excessive absorption of it or to an acquired deficiency. In the first case, the secretion exuded from the cut surface of the gland is absorbed by the lymphatics and enters the circulation as a poisonous dose, which produces a very rapid pulse, a very high temperature, a very rapid

respiration, and a very excited or even maniacal condition. There is no mistaking the symptoms and all that can be done is to open up the wound, wash it out thoroughly with hot normal saline,and provide very free drainage for the wound, or even leave it widely open for the moment packed with gauze soaked in saline. So great may have been the absorption of secretion and so rapid and toxic its effect, that these cases of *acute thyroidism* sometimes prove fatal.

Conversely if the removal of the diseased gland has been too thoroughly done, the remaining part may atrophy and the patient gradually suffer from symptoms of *thyroid insufficency,* going on eventually to a definite myxoedema, which will require treatment by thyroid gland substance as indicated for this same condition from any other cause. *Tetany* may also prove a dangerous symptom before myxoedema develops, and I have recorded one case of death from spasm of the larynx, probably of a 'tetany' nature.

The *operation for malignant goitre* should only be entertained at quite an early stage, and before any severe degree of fixation to deeper structures in the neck has occurred. Even without this evidence malignant cases are likely to prove quite beyond any operative skill. The haemorrhage from the superficial veins, from those between the deeper fascial planes of the neck, and from the gland itself, which from an early stage is incorporated with the sterno-thyroid and sterno-hyoid muscles, may be very serious ; and this and the firm attachment of the diseased gland give some indication of the difficulties likely to be met with in the deeper planes of the neck ; and many an operation has to be - and very wisely - abandoned. In early and still self-contained cases, the *whole* gland may be removed ; and, in the absence of secondary developments, thyroid grafting may be done or feeding with thyroid tablets must be started and continued indefinitely.

EXOPHTHALMIC GOITRE is very occasionally seen in the medical wards but is rarely, if ever, submitted to operation.

I can remember two cases in which a very much enlarged THYMUS was found at the autopsy of deaths under chloroform anaesthesia.

PLATE 42.



Fig. 1.—Malignant goitre. P.A.



Fig. 2.—Exophthalmic goitre. P.A.

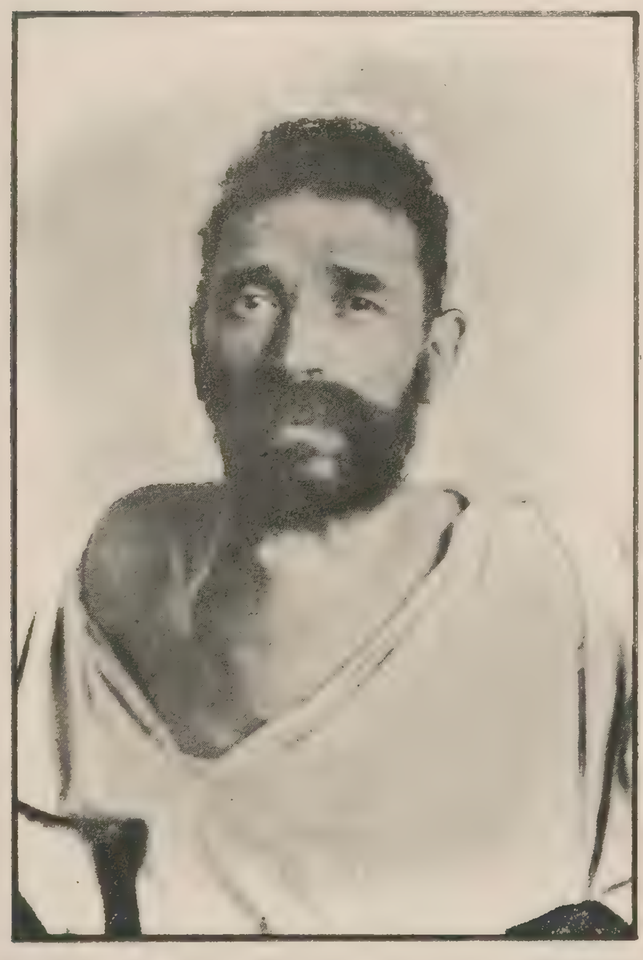


Fig. 3. — Malignant goitre with secondary growths in sternal end of clavicle and skull. P.A.

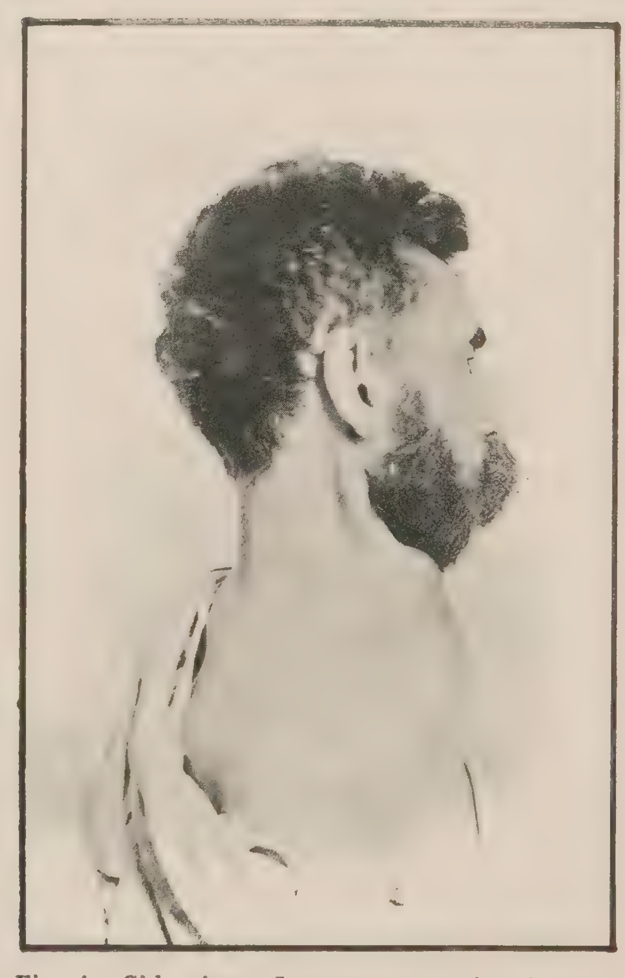


Fig. 4.—Side view of same case as in Fig. 3.

XXIII. SURGICAL CONDITIONS OF THE RESPIRATORY TRACT AND CHEST.

There is but little to add or comment upon in the subject of *foreign bodies in the air passages* generally, though they are particularly rare; and the only form of severe laryngeal trouble at all common is that due to the hopeless *destruction of the larynx* and its cartilages by old syphilis. On this account, and also from the frequency of very large malignant glands in the neck producing laryngeal obstruction, tracheotomy is a common operation and it rarely happens that the patient is ever able to do without his tube during the rest of his life.

PENETRATING WOUNDS OF THE PLEURA AND LUNGS are frequent, from stabbing or bullet wounds, and the principles we follow are essentially those already described in the section on bullet wounds of the chest ; our rule being to be as expectant and conservative as possible and only to undertake operative procedures when absolutely necessary or when there is very clear indication for it.

EMPYEMA THORACIS is common and is due to the usual causes and is treated by early excision of rib and thorough drainage. In very septic cases a counter opening may be made and free irrigation of the pleural cavity with saline solution, eusol or a weak oxygen water with great benefit. It is rarely necessary to perform any more extensive operations on the chest walls.

Certain of these empyemata may be due to the rupture of an abscess of the liver through the diaphragm ; but, in most cases when this happens, the lung has already become adherent to the inflamed diaphragm and, when perforation occurs, the pus passes directly into the lung and is expectorated by way of the larger bronchi, as will be further described in a later section. If the rupture through the diaphragm *does* take place into the pleural cavity, this must be drained as an ordinary empyema ; and, at the same time, the original abscess cavity must be evacuated and drained by the excision of a rib lower down, as though it were an uncomplicated liver abscess or subdiaphragmatic abscess from other cause.

In all these cases of pus in the pleural cavity appropriate vaccine treatment, especially with pneumococcic and mixed staphylo-and strepto-coccic strains, very frequently proves of considerable benefit.

DISEASES OF THE BREAST. **As** in all native races, where the breasts are entirely unsupported by the clothes and are almost constantly in use—the Egyptians are a most prolific race and they nurse their babies for two years, or until another is actually born—some enormous breasts are seen. These occur quite apart from the rare instances of elephantiasis or general hypertrophy.

Acute mastitis, from cracked nipples or other nursing causes, is very common and generally reaches us when abscess has already developed in one or other part of the breast : but *chronic mastitis* is quite rare. In some cases the suppurative inflammation takes the form of a diffuse cellulitis of the breast. This requires a very vigorous and prolonged treatment, to combat not only the cellulitis, but also the accompanying septic infection. It is, in fact, a virulent septic cellulitis runing riot in an already markedly hyperaemic breast.

Chronic abscess is usually tuberculous and generally secondary to a necrotic caries of underlying ribs. Very extensive operations are sometimes necessary to remove the whole of the tuberculous disease.

Tumours of the breast (apart from cancer) and *cysts* of all kinds are very rarely seen. I have seen a few cases of very rapidly growing *sacroma* developing in breasts of young nursing mothers, and they are already, or soon progress, beyond the reach of any operative interference.

Cancer of the breast has been already noticed in the section on tumours.

XXIV. THE SURGERY OF THE ABDOMEN.

THE SURGERY OF THE ABDOMEN IN EGYPT differs from English practice in many respects, partly owing to the peculiar rarity of certain abdominal conditions, but also on account of the indifference of the average ignorant Egyptians of the lower classes, who often present themselves with an enormous, apparently hopeless, tumour quite beyond the limits of any operative procedure, and which at best can only be subjected to exploratory laparotomy.

Some of the commoner English conditions are conspicuous by their absence or, at any rate, by their extreme rarity. Among these may be numbered *gastric* and *duodenal ulcers*, which only very occasionally occur and exceedingly rarely come to operation in ordinary hospital practice. They *do* occur, it is true, but so rarely, that an operation on the stomach for *any* condition is quite an event in a student's hospital life. This applies equally to *ulcer*, *obstruction*, and *cancer* of the stomach with their possible complications. Further, though the stomach is often found *dilated* to a considerable extent, it is accepted as such by its host and surgical intervention is never sought.

Similarly, *idiopathic dilation of the colon* is a curiosity; as is also *chronic intestinal stasis* (Lane) and I only remember to have operated on two such cases in Egypt.

All the various conditions of the *gall-bladder*—from calculus to cancer — are almost never seen in the surgical wards; but it is to be remarked that all these and the foregoing conditions become increasingly commoner as the patients come to the towns, become more civilised, and reach a higher grade in the social scale.

Diseases of the *pancreas* also seldom occur. Cancer may be seen, secondary to a growth in the stomach, and chronic pancreatitis also; and three typical cases of very large pancreatic cysts were opened and drained during the last few years and did very well.

INJURIES AND WOUNDS OF THE ABDOMEN. The many severe accidents to which the careless, blind and indifferentEgyptian vagrant and labourer is subject, implicate the abdomen in a comparatively large proportion of cases; and as many others are inflicted with murderous intent, the motive being some petty private quarrel or family feud, or an outbreak of sudden primeval passion and savagery in the course of a village melee.

Such cases fall naturally into two classes:— (1) those in which *no external injury* of the abdomen or its boundaries is evident; and (2) those in which a *wound*, either accidental, stab, or gunshot, of varying dimensions, is the predominating feature.

(1) *Injuries of the abdomen without external wound.* In this class of case when first seen there are all the usual evidences of shock, common to any severe injury; and, in addition, pain and tenderness in the abdomen, some interference with or even absence of abdominal respiration, and some-

times vomiting. The signs and symptoms of a definite internal injury may already be present or become more and more marked every moment, and in such an event operation is urgently called for.

A suspicious case, on the other hand, must be kept absolutely quiet in bed, well-packed with hot-water bottles, and all the other measures for combating shock applied ; should have nothing by mouth ; have the urine drawn off, if not soon passed, and examined for blood ; and the stools, if passed naturally, examined for similar evidence of injury to the gut. Vomited matters must also be kept and carefully examined ; and, above all, the pulse must be counted and noted every quarter of an hour. If it is going up and with it other untoward symptoms, such as restlessness vomiting distension and increased rigidity of the abdomen, dulness in the flanks and absence of liver dulness are becoming worse, immediate action by operation is necessary. If, however, the pain is relieved by hot applications, the pulse improves in volume and rate, the urine and faeces are naturally passed and are free of blood, and the abdominal respiration slowly but steadily improves with the improvement in the general condition, no operation will be necessary; at all events for the present, though a very careful watch must still be kept for trouble for the next forty-eight hours at least.

The operation of laparotomy. Should it be decided to operate, this must be done with all the care possible under the circumstances of the case and as time permits. This series of preparations for operation has already been enumerated in a previous section ; but in abdominal work special precautions must be taken to prevent or minimise shock, by giving rectal saline injections and, if need be, saline by subcutaneous tissues or even vein. These two latter measures may be continued during the course of the operation with very satisfactory results. The patient must be kept thoroughly warm and covered throughout ; and all the preparation of instruments dressings theatre etc. must be completed before starting the anaesthetic: and the operator and his assistants must be quite ready to begin the operation as soon as anaesthesia is complete. Everything must be planned to ensure a quick and clean operation; and the best anaesthetic in most cases is a preliminary chloroform followed by open ether, preceded by a hypodermic injection, about a quarter of an hour before operation,of 0.01 (1/6 grain) of morphine and 0.0065 (1/100 grain) or even less of atropine. Stovaine may be used in suitable cases with great satisfaction.

The abdomen is prepared locally by the iodine method previously described and the actual operation area thoroughly protected with sterilized towels.

In the absence of localising signs a free incison is made in the middle line, or, preferably, just half an inch to the right or left side of the middle line so as to avoid the umbilicus, and the incision should extend for some distance both above and below this point. It must be increased in either direction without any hesitation if there is not sufficient room. The skin edges are well protected with sterilized pads, fixed in place by Moynihan's forceps, and no skin is visible anywhere in the operation area once the incision has been completed and the pads fixed in place. The sheath of the rectus is opened as the incision is deepened, the muscle drawn aside or divided in the line of its fibres down to the peritoneum ; and, finally

the peritoneum is incised and opened up to the length of the skin incision. On incising the peritoneum blood may well up at once, generally in large clots, or in a steady stream. The masses of clot must be at once removed with sponges soaked in hot normal saline and a rapid but systematic search made for the bleeding point, starting at the liver and working across to the spleen and thence down the course of the colon on each side. Finally, the root of the mesentery is defined and the fan of this structure with the small intestine to which it is attached examined. All necessary repairs are done as they are found and the pelvic cavity is cleared of blood and its various organs carefully investigated. In the course of this examination of the contents of the abdomen, bleeding points must be dealt with on sound surgical principles and, after a final swabbing out of the various pockets where blood clot might lodge, the abdomen is closed without drainage in the usual way. If pus or faeces is found in the peritoneal cavity search must be made for the torn or otherwise injured gut and the necessary repairs done; after which the case is treated entirely like a septic peritonitis and the abdomen freely drained, as will be more fully mentioned with appendicitis. All sponges must be counted and accounted for.

Whenever it is possible to do so the abdomen is closed without drainage ; the peritoneuum being sutured with fine catgut on a round needle, the sheath of the rectus or linea alba with stronger catgut and the skin secured with clips.

The *after treatment* of the patient is most important and, though it must vary, to some extent, with each individual patient, there are certain broad lines, applicable to all abdominal operations, which have been gradually worked into a system with us and include most of the possible ordinary complications as well. I can strongly recommend the perusal of an article in the Practitioner for March 1910 by Herbert Paterson on the subject which, though I have only recently come across it, very closely follows the scheme our experience here has gradually evolved. I shall quote largely from this article as many of the points to be observed are so clearly expressed.

After the operation the patient must be lifted from the table to the stretcher, and from that to the bed, with the greatest possible care and gentleness. In this way the onset of vomiting may be prevented. The bed has been already warmed and properly prepared with hot-water bottles and the patient is put in it lying on the back, partly on the side, and well packed round with hot-water bottles. It is much more comfortable for the patient to put him not absolutely on the back but with his head turned to one side and a pillow under the opposite shoulder.

As soon as he is sufficiently roused from the anaesthetic to be able to support himself to some extent, he is put into the Fowler's position, either by means of a specially constructed bed made in three pieces, or by being sat up with a bed-rest, and a bolster placed under the bent knees and tied by ropes at either end to the head of the bed. At night he may be turned on the side to sleep but still kept up. The Fowler position should be maintained for four days at least, and most patients find it so comfortable that they ask to have it left for many days longer. It is the best position for all abdominal operations; but especially for suppurative peritonitis in which the peritoneal cavity has been drained, as it allows all

free fluid to drain down into the pelvis, where a drainage tube has been placed and which may be cleared by a syringe, to the nozzle of which a fine tube is attached.

As a matter of routine also a saline injection of from 300.0 to 500.0 of hot normal saline solution is given bv rectum four times a day for the first forty eight hours; and in cases associated with general suppurative peritonitis or severe shock, continuous saline may be administered by rectum through Paterson's electric apparatus, which should be so adjusted that the fluid runs into the rectum at the rate of one pint (570 c.c.) in an hour and the temperature is kept at 42°C. (108 F.) in the douche can. After 1 ½ pints (800 c.c.) have been introduced the injection must be stopped, but the rectal tube should not be removed, and the flow started again two hours later. From five to ten litres can be given in this way at intervals during twenty four hours. This continuous rectal injection dilutes the toxins and renders them less harmful, stimulates the lymphatic flow and so drains the peritoneal cavity; it raises the blood pressure and so diminishes shock; and it relieves what may sometimes be an intolerable thirst. In septic cases it must be continued until the case is out of danger. In cases of extreme shock after an abdominal or, indeed, after any other serious operation, the value of hot normal saline solution, administered either rectally subcutaneously or intravenously, must always be remembered; and in certain cases the peritoneal cavity may be filled with a similar solution, just before the final sutures are inserted, and often with great benefit.

As soon as the patient is round from his anaesthetic he may be given small quantities of water or barley water which must neither be too hot nor too cold; and, provided there is no sickness, an ounce (30.0) of equal parts of milk and barley water may be started in six hours time. The quantity may be rapidly increased until he is having 50.0 every two hours, with water in between if the thirst is troublesome. This diet is continued for the next twenty four hours, after which soup, Benger's food, junket, or leban zabady, لبن زبادي ,may be added and a rapid return made to good middle diet, through the stages of bread and milk, bread and butter, egg and milk, thickened soup, milk puddings, milk and rice, mahallabeah, مهلبيه balouzah بلوظه etc. until the patient is back to his natural diet in about ten days' time. It is, of course, to be understood that the diet must be modified to some extent for each particular operation and patient, but the main lines are as above. If the case is going on satisfactorily do not be afraid to increase the diet rapidly within reasonable limits, especially when, as may sometimes happen, the patient has been starved, on account of his illness, for a considerable time before his operation.

Rectal feeding is hardly ever necessary and the best nourishment given by rectum is probably saline solution, to which may be added, according to circumstances, a generous quantity of brandy. In exceptional cases, and as a temporary expedient, milk eggs beef-tea or brandy may be given by rectum, a rectal enema never exceeding 100.0 in amount and being given not oftener than every four hours. The rectum must be washed out with plain water or saline before the nutrient enemata are started; and, once a day, the residue, of which there may be much more than is expected, must be washed out with a soap and water enema. Suppositories of milk and of meat are also sometimes of service.

Especially valuable, too, by rectum, as a 5% solution, in water filtered and and boiled, is glucose; and it is particularly to be advised, not only as a food but also as a direct curative measure, in the case of threatened delayed chloroform poisoning after operation.

The *bowels* must be early attended to after an abdominal operation. If there is any distension or discomfort, with colicy pains, a soap and water enema with turpentine, 15.0 to the half-litre, may be given the following day, preceded by a hypodermic injection of pituitrin. This drug is particularly useful in all cases of distension and threatened atony of the intestine and should be used as a routine measure in septic peritonitis cases. It is put up in ½c.c. ampoules and may be given as often as three times a day in bad cases, though, in general, its use must be entirely symptomatic. Thus used it is often of great service.

In most cases it is not necessary to give an aperient till forty eight hours after the operation; and the two most generally useful drugs are sulphate of magnesia and calomel. Our usual practice is to give 5.0 of magnesium sulphate dissolved in 30.0 of peppermint water every hour for six doses, after which a soap and water enema is given to assist the action of the sulphate. This generally leads to a good evacuation and the passage of any gas that may have accumulated in the gut. Should the bowels threaten to act before all the doses have been taken, and this is generally the case, the enema is to be given at once and the remaining doses omitted.

Calomel may be given in much the same way in 1/4 grain (0. 015) doses every half-hour for six to eight doses, followed or replaced by an enema before the series is finished, as before.

Personally I prefer the sulphate of magnesia and if the result is not satifactory give a good dose of castor oil, 30.0 followed by 10.0 of sulphate of soda the following morning. If the bowels are still difficult a second dose of oil may be given, the pituitrin repeated, and certain special enemata, in an increasing scale of power. We start with an ordinary soap and water enema, then with one to which turpentine has been added, and finally one composed of sulphate of magnesia, 50.0 and essence of peppermint, 0.30 in hot decoction of senna, 500.0. This purgative enema is usually very effective. Glycerin 60.0, with 30.0 of magnesium sulphate in 100.0 of very hot water, may also be tried as an alternative; and, in this case, and with all other enemata, the effect is more likely to be satisfactory if they are given high up in the rectum by means of a long rectal tube. 100 c.c. of warm olive oil may also be useful as a preliminary to a turpentine enema and to it 50 c.c. of castor oil may be added. When there is vomiting, a large draught of warm water, 500.0, to which 5.0 of sodium bicarbonate has been added, may be given ; and, if further vomiting is excited, this may be followed immediately by a dose of calomel (0.30) washed down with a little water, and this whole performance may be repeated if necessary. A mustard leaf to the epigastrium and sometimes 5 drops of tincture of iodine (B.P.) in 5 c.c. of water may be given and repeated half-hourly, in cases of obstinate vomiting, and often with good effect. If the bowels cannot be opened in spite of all these measures, and vomiting and other obstructive signs appear, an operation will be necessary to relieve the obstruction.

If, however, no vomiting is present and the general condition, apart from the constipation, is satisfactory, the food may be increased and no further aperients given for twenty four hours, after which a dose of castor oil may be thoroughly effective.

Once the bowels have been well opened they must be kept regular by an early morning dose of sulphate of soda, 5.0 in a glass of hot water, or by regular doses of white mixture, two or three times a day. Paraffin in tablespoonful doses twice a day may also be useful; and perhaps the most satisfactory and regular of all is senna tea, made by soaking 5-10 senna pods for some hours in a small glass of hot water and the fluid taken overnight, with a weaker dose made by pouring cold water over the same leaves and, after it has been standing all night, drinking the infusion in the early morning.

The *urine* may require to be drawn off by catheter, and, in any case should be measured and a specimen saved for examination for the first three or four days after operation. Any diminution in quantity, albumen, or suspicion of acidosis are particularly dangerous complications.

After all abdominal operations, *information is especially required* concerning:

1. The condition of the patient generally, presence of shock etc.
2. The condition of the pulse, respiration, temperature, tongue, abdomen, bowels, urine, and mental condition, especially as regards sleep, restlessness, stupor, delirium etc.
3. The occurrence of vomiting and the appearances of the vomited matter.
4. The degree of thirst and the amount and nature of the nourishment taken and its effect.

The *treatment of the abdominal incision* is that of any other aseptic wound and the clips may be removed in 7-10 days, painting the wound with iodine when the dressing is changed. After the operation firm pressure is made, either with a broad binder or a many tailed bandage, but this must be undone and fastened again more loosely the following day, as it becomes very uncomfortable when the patient is kept in the Fowler position. The dressing need not be touched until the clips or sutures are removed. After this a firm binder must still be applied for some time and, in the case of a fat patient or one who will shortly have to do heavy work, a proper abdominal belt must be fitted and worn for three months or more, until the scar in the abdominal wall has become absolutely firm.

The *duration of rest in bed* after an abdominal operation varies considerably in different cases; but a simple appendix operation, for example, may be allowed on to a couch in from 7-10 days and walk in a fortnight. When the patient has been ill for some time before the operation he will require a good rest after it; and no case must be allowed to be up until he is taking plenty of nourishing food and is doing well on it. The condition of the heart must always be considered and iron and arsenic and

other tonics, with maltine and even codliver oil, are often of great benefit. With Mohammedan patients one is debarred from the undoubted tonic effects of medicated wines such as Vin Mariani, Kola Wine, or Coca Wine, but the drugs contained in them may be beneficially used in other combinations. When the incision has been made in the middle line and the wound is above the umbilicus, the patient may be got up a few days earlier than when it is below that point.

Complications after abdominal operations. The commonest immediate complication after an abdominal section is *shock* which may be due to the original condition for which operation was required, a badly given anaesthetic, the length of the operation, haemorrhage before or during the operation, and to careless, rough, and unnecessary exposure and handling of the viscera in the peritoneal cavity. The best treatment of shock is preventive. This includes the proper preparation of the patient, as already indicated, the small injection of morphia just before operation and the employment of open ether for the anaesthetic, the use of saline subcutaneously during the operation, or even intra-venously, and the constant rectal saline, and brandy, especially with saline and other measures enumerated above, after it. Pituitrin and saline are more useful than strychnine; and digitaline in 1/100 grain (0.00065) doses hypodermically, and camphor oil, sometimes combined with ether, are often of service.

Pain after operation may be controlled by hypodermic injections of morphia; but this should not be repeated more than twice and a search made for some definite cause for the pain, such as a tight bandage, an uncomfortable position, or flatus, all of which can be relieved by appropriate measures. A small dose of veronal (0.30) may be given and repeated in three or four hours time with excellent effect to promote sleep; aspirin or phenactin may also be useful, or 10 grains (0.60) of Dover's powder in a little hot milk.

Nothing is more effective in *post-anaesthetic vomiting* than the large draught of bicarbonate of soda in water; and if this is not effective the stomach may be washed out, though this is a very unpleasant proceeding. In certain cases hiccough may prove very troublesome and persistent, and after the bicarbonate draughts, I have found the administration of five drops of tincture of iodine in a teaspoonful of water every half-hour of much benefit. A lump of sugar may be tried first.

The treatment of *distension,* which, if left, threatens to become obstruction has already been mentioned, and in this condition pituitrin is very valuable. A rectal tube passed high up and left in may be very beneficial.

Parotitis very seldom occurs, from septic infection from the mouth, and must be treated on the usual lines, as also bronchitis and bronchopneumonia, which are particularly liable to occur after splenectomy and liver abscess, and may be averted by the use of a prophylactic injection of pneumococcus vaccine, and improved by further doses after the operation and by the Fowler's position.

Drainage tubes should be left in rather too long than too short a time and should not be removed till the discharge from them, which already has become serous, has almost entirely ceased. Even then it is well to insert a narrow strip of gauze into the track for a day or two to ensure complete closure and prevent any accumulation of pus or serum along the track.

(2) *Injuries of the abdomen with penetrating wounds.* A great many different varieties of penetrating wounds of the abdomen are met with in Egypt; from a tiny stab by a pen-knife or a toy pistol bullet, to the large ragged destruction of the whole thickness of the abdominal wall from the discharge of a heavily loaded shot-gun at close quarters by an unusually zealous and wakeful gaffeer.

The amount of *shock* varies considerably also, being largely dependent upon the particular area injured and the extent of the internal damage. Further, these wounds are often inflicted in the heat of a quarrel and many of the cases do not notice the injury at the time but after reaching hospital may suffer severely from deferred shock. Haemorrhage also may be severe and contributes largely to the shock in practically all cases.

Apart from *shock and haemorrhage,* the symptoms vary with each particular case, though they present a generally characteristic picture which must be studied elsewhere as it has nothing essentially Egyptian about it. The symptoms, as a whole, are really not of much value as a guide to treatment, since all these cases when the general condition is not too desperate, should be operated on as soon as it is possible to make the necessary arrangements.

Some cases reach hospital practically dying and no operation can be thought of for the time being. The patient must be put to bed, packed with hot-water bottles, given saline by rectum skin or vein, placed in an electric light bath, and treated by all the various restorative measures already enumerated ; and, though not *always* successful, it is surprising in what a comparatively large proportion of cases the patient is practically brought back from the grave, at any rate sufficiently to allow an attempt to be made to save him by operation.

Writing of penetrating bullet wounds of the abdomen, Colonel Sir Crisp English in the Lancet of October 28th 1916 puts the case very well. He writes ;—"The routine procedure adopted for these abdominal cases was as follows. On admission the patients were put comfortably to bed, warmed with plenty of blankets and hot-water bottles, given saline solution subcutaneously or by rectum, and morphia if in pain. The majority were suffering from shock and the effects of haemorrhage, and these were kept for two, four or six hours, until they were better, and operation was not performed until the radial pulse was of fair volume and its rate under 140. We are convinced that it is not advisable to operate immediately on patients with rapid pulse-rates ; they nearly always require much repair work and the prospects of success are decidedly better if time is spent in attempting to improve their general

condition. Some patients presented few or no signs of shock and these were operated on as early as possible. In doubtful cases when it was uncertain whether the peritoneal cavity had been penetrated or not, our rule was to explore the wound. By doing this we several times discovered intestinal injuries at an early stage, before there were any external signs of their existence."

Essentially the same rules hold for civil practice in penetrating abdominal wounds ; and we must never be deceived by the small size of entry or exit wound, as this gives no indication of the extent of the injury within the abdomen.

In addition to those cases admitted moribund, though, even then, some of these may be made fit for operation later, we must be expectant in our treatment in *cases of penetration of a solid organ*, and especially the right lobe of the liver, when there is no evidence of injury of a hollow viscus or signs of active internal haemorrhage ; and also when the diaphragm has been pierced by a wound in the upper part of the abdomen which has produced haemathorax. At any time, on the first appearance of dangerous symptoms, operation must be done without delay.

The *operation* is performed in exactly the same way as for an exploratory laparotomy, as described in the preceding section, and the incision made in the middle line or just to one side of it, the actual wound hardly ever being enlarged to complete the abdominal section, as it is usually septic and may be excised or otherwise dealt with later. Lots of room must be allowed and the original incision lengthened as necessary. There is no difficulty in getting a long abdominal wound to heal and much harm may be done by trying to work through a small incision. I may add a short description of the procedure adopted by Colonel English in his cases.

"For wounds of the lower abdomen we found it a considerable help to have the pelvis raised, the best position being about 30° from the horizontal: for efficient treatment of bladder injuries this is essential...... After the opening of the peritoneal cavity the first step was to clean out the blood and other fluid, especially from the pelvis, which usually contained a large pool. Until this has been done it was difficult to see accurately the extent of the damage. A systematic examination of the abdominal contents was then rapidly made. The small intestine and its mesentery were first looked over from the caecal end to the duodenum; the operator lifted out seven or eight inches of the intestine, examined it, and then left it for his assistant to return while he proceeded to examine the next loop. In this way there was never more than a foot or so of intestine outside the wound, and the whole of the small intestine with its mesentery could be examined in three or four minutes. Unless this systematic search is made it may happen that eight perforations are found and dealt with and the ninth overlooked. The search was next extended to the colon, stomach, and any other viscera which might have been injured. Tears and perforations were treated by suture or excision of the intestine according to circumstances, and mesenteric injuries were carefully dealt with. Finally, the pelvic cavity was usually irrigated with saline solution, some of which is left there, and a large drainage tube inserted and secured by a stitch."

If the *liver* is torn an attempt may be made to insert a fine catgut suture on a small round-bodied needle; but, if it cuts through, it is best to lightly pack the wound with gauze and bring the end out of the upper corner of the abdominal incision, or through a fresh incision laterally or posteriorly. If a portion of liver is nearly separated it is best to cut it off and check the bleeding by suture or gauze pad. These cases are extremely dangerous and very frequently fatal, especially when the main body of the liver has been tunnelled by a bullet or pierced by a knife or bayonet.

Wounds of the *stomach* are also very dangerous and must be treated by suture with invagination of the hole, if possible, and omentum may be utilised to fix over the sutured wound and so act as an omental graft. Especially must the posterior surface of the stomach be examined by tearing a hole in the castro-colic omentum and invaginating the stomach through it. The omentum must be sutured after replacing the organ. The parts all round the wound must be thoroughly cleansed with gauze sponges, wet with hot saline solution, and a drain inserted down to the region of the sutures and another large tube placed in the pelvis, if there are any signs of septic peritonitis. In extreme cases it may be necessary to excise a portion of the injured stomach, though when this appears necessary, the case is usually beyond much real hope.

When the *spleen* is injured it is best to remove the organ entirely and ligature the pedicle securely. When it appears probable, either with or without an abdominal wound, that the spleen is injured (and especially with evidence of haemorrhage with, perhaps, a dull area over the lower ribs in front on the left side), it is well to open the abdomen by a free incision through the left rectus muscle, as this gives better access to the spleen than the central incision. We have had a very good series of recoveries after ruptured spleen from injury in Kasr-el-Ainy in the last three years, during which period ten cases have been treated by removal, with only two deaths.

Dr. Ibrahim Fahmy, Assistant Surgeon to Kasr-el-Ainy, considers the essential signs of a ruptured spleen are as follows:— A history of injury, often with fracture of lower ribs; pulse rather slow for abdominal injury; marked anaemia; rigidity of the whole abdomen and especially on the left side; some distension of the abdomen; some fluid in the peritoneal cavity with dulness over it continuous with splenic dulness and, sometimes, shifting dulness with change of position; and usually marked pain and tenderness on the left side high up near the costal margin and the loin.

There is a special liability to ruptured spleen from disease in Egypt, but actually it is a very rare accident except from a very severe abdominal injury. Malaria, Egyptian splenomegaly — the local form of Banti's disease — Hodgkin's disease, and other splenic and blood diseases are common enough but the resulting enlarged spleens are fortunately hardly ever ruptured by violence. After excision of the spleen. in absence of any intestinal injury, the abdomen may be closed without drainage.

Injuries aud perforations of the intestines must be dealt with on the well-recognised lines by suture, excision, occlusion and lateral-anastomosis, or the formation of an artificial anus as may be necessary, In

case of excision of the small intestine the portion of the gut above and below the actual perforation must be freely excised, especially above, as paralysis of this portion — ileus — is liable to occur after operation unless this rule is observed (Richards). The technique of these operations can only be learnt by actual experience and the actual method must be studied theoretically in larger text-books. Only in cases where the perforations are single and the injured area can be thoroughly cleansed, must these cases be left without drainage of the peritoneal cavity by one or several tubes.

Wounds of the mesentery and omentum must be carefully closed to prevent any subsequent trouble from internal hernia, from a coil of gut passing through the hole.

While all the necessary repairs are being done to the different organs ,*bleeding* must be arrested and the abdominal cavity then cleared, as far as practicable, of blood clot and faecal matter. The method of complete drainage of an infected peritoneal cavity will be fully described in the section on general septic peritonitis in connection with appendicitis.

If, on exploring the abdomen, blood is found proceeding through a hole in the posterior layer of the peritoneum, from a wound which has evidently penetrated the *kidney*, the other kidney must be examined, any other repairs which may be necessary should be done, and the abdomen closed or drained ; after which the patient is turned over and an incision made on to the injured kidney from the loin, through which a portion or the whole kidney may be removed, not at all an easy matter in these cases. It may sometimes be possible to remove such a kidney by anterior nephrescomy, if the case is recent, the other kidney uninjured and no infiltration of urine has occurred into the retroperitoneal tissues. The same principles must be followed in cases of wounds of the kidney without penetration of the peritoneal cavity and in retroperitoneal haemorrhage from other causes.

Any intra-peritoneal injury of the *bladder* must be carefully sutured if possible and the bladder drained, either by catheter through the urethra, or by a tube introduced into the bladder supra-pubically below the peritoneal reflection. The peritoneal cavity must also be drained by introducing a tube down to the sutured wound in the lowest part of the peritoneal cavity and another into the pelvis.

The general *prognosis* of all penetrating wounds of the abdomen is bad, but how grave it may be can only be gauged on opening the abdomen. Operations must be done in all cases with the exceptions we have mentioned, and the essentials of a successful operation are to treat and prevent further shock in every way possible, be quick and yet be gentle, make a systematic search and repair everything possible, and thoroughly drain the abdomen and pelvis. If these measures are properly carried out and the case is treated afterwards with all the care and detail already described, we have done our best and deserve success. With all our care and skill, however, the mortality is high, and must necessarily be so, though with our improved technique in every way, the results are infinitely better than they were some years ago and are likely to be better still.

English gives figures for the first six months of 1915, in the case of penetrating bullet wounds of the abdomen treated under essentially war conditions, which show that the mortality in field ambulance and clearing stations was 73.8 per cent (48 out of 65 penetrating cases); and the mortality at the base hospitals was at least 35 per cent during this period. In the last six months of the same year the combined mortality in the field ambulances and clearing stations was 61.25 per cent - a reduction of 12.5 per cent. Including with this the statement of the results at the base hospitals, the total improvement in mortality is well over 20 per cent.

XXV. DISEASES OF THE ABDOMEN.

As we have already indicated, there are considerable differences between the classes of abdominal diseases met with in Egypt and elsewhere; and we must now proceed to describe in considerable detail one of the essentially Egyptian conditions, and one which is peculiarly associated with our Medical School.

BILHARZIOSIS—or probably more correctly bilharziasis — is a disease of very considerable antiquity, and we shall later bring forward certain evidence that it was known and its dangers recognised by the ancient Egyptians.

Historical. The whole story of bilharziosis is closely interwoven with that of our Medical School; as it was here that Bilharz discovered the worm which, from the time of its first christening by Cobbold, has been universally known by his name. The modern history of our hospital and school dates back to 1798, when the French under Napoleon Bonaparte "turned Kasr-el-Ainy into a hospital and apparently fortified it by a surrounding wall." (For this fact, and the rest of the historical details, I have quoted extensively from, and, for further particulars, must refer you to, Sandwith's History of Kasr-el-Ainy, published in the first volume of the Records of the School of Medicine, 1901). The French used our hospital until their retirement from Egypt in 1801; and during their occupation the great Larrey, who was Napoleon's Surgeon-in-Chief, studied in its wards, in April 1800, during the siege of Cairo, an epidemic of fever, besides ophthalmia, scorpion stings, and many other diseases. Larrey says that the hospital was crowded with sick and wounded soldiers and had no proper supply of drugs, dressings, bedding or medical comforts. In the same year General Kleber, who had been left in command of Egypt after Napoleon left, complained of the scandalous state of the hospital, ordered necessary reforms, and sent 300 pints of wine to the patients. In June 1800 General Kleber was stabbed by a fanatic from Aleppo in the garden on which a part of Shepheard's Hotel now stands. His funeral procession stopped at Kasr-el-Ainy, where the coffin was put on raised ground covered with earth and surrounded by a railing. The grave was shaded by a white tent, cypresses were planted round it, and two sentries guarded it by day and night. One evening, in July 1801, the mausoleum at Kasr-el-Ainy was opened and the leaden coffin removed, to travel with the retreating army to France. The Vizier, Yussuf Pasha, and the Turkish troops entered Cairo immediately after, amid general rejoicings, to take possession in the Sultan's name. The English upon their arrival were filled with admiration of Desgenette's—a colleague of Larrey—hospitals, particularly the great one at Cairo (Kasr-el Ainy).

The hospital then passed through troublous times until, in 1805, Mohamed Aly Pasha was elected Valy of Egypt; and, in 1825, he appointed Clot Bey as Physician and Surgeon-in-Chief to his new army. Clot was followed by 154 European medical officers and apothecaries, mostly Italians and Frenchmen.

In 1827 Clot established a medical school at Abu Zaabel, to furnish surgeons and apothecaries for the new army; and in ten years he produced 420 medical officers for the army and navy. In November 1832, five years after the formation of the Medical School, twelve picked Egyptian students wearing turbans and flowing robes, were taken to Paris by Clot Bey and were formally examined by fourteen well-known medical professors, including Desgenettes, Larrey, Dupuytren and Orfila, some of whom had served in Egypt during the French occupation.

In 1837 Clot succeeded in having both hospital and school transferred from Abu-Zaabel to Kasr-el-Ainy; and says that Kasr-el-Ainy consisted then of four ranges of buildings in a square, sixty four spacious apartments of forty beds each, of two stories, with a separate building for the pharmacy, the chemical laboratory, the museum of physics and natural history, and the amphitheatre, with kitchens etc. Under Clot's vigorous management the hospital and school flourished exceedingly; and in 1849 the school consisted of 125 medical and 25 pharmaceutical students and the medical course had been extended to six years. Interesting cases were sent to Kasr-el-Ainy from the civil and military hospitals in the provinces and the fame of the staff reached Greece, Syria and Arabia, so that patients from these countries came every year to be treated in Cairo.

The following is the translation of the Hippocratic oath taken by the Egyptian students on leaving the Medical School. The original Arabic version now hangs in the library of our school and may be translated thus:— "I swear in the name of God the Most High and of His sublime prophet Mohammed, whose glory may God increase, to be faithful to the laws of honour honesty and benevolence, in the practice of medicine. I will attend the poor gratuitously and will never exact too high a fee for my work. Admitted into the privacy of a house, my eyes will not perceive what takes place; my tongue will guard the secrets confided to me. My art shall not serve to corrupt nor to assist crime; and I will not yield under any pretext or persuasion to prescribing any poison to anyone. I will neither give nor prescribe to any pregnant woman dangerous drugs capable of provoking or producing an abortion. Ever respectful and grateful to my masters, I will hand on to their children the instruction which I have received from their fathers. May I be respected by men if I remain faithful to my vow. If not, may I be covered with shame and be despised. God is witness to what I have said. The oath is finished." In the corner of the original is written "the Medical School was founded Zilhegga el Haram, 1242, (A.D.1827); and in the other corner; "It was Mohamed Aly who introduced science into Egypt".

In the years 1848—49 Mohamed Aly Pasha and Ibrahim Pasha died and were succeeded by Abbas I, who discouraged all French enterprises and stopped, during the five years of his reign, most educational progress. The medical school suffered like others and Clot Bey retired to France in disgust. After his departure Abbas I. decided to substitute German professors for French; and engaged Wilhelm Griesinger, then Professor of Pathology at Kiel, to fill the triple post of Director of Kasr-el-Ainy, President of the Sanitary Council, and personal Physician to the Viceroy. Griesinger reached Cairo in June 1850, accompanied by his former pupil, Bilharz, who now came as his assistant, and by Royer, who had been elected his surgical colleague. Griesinger had a very difficult position to

fill and only stayed until May 1852, when he returned to Germany; and in 1853 -4 published the discoveries he had made in Egypt, including Bilious Typhoid, Anchylostoma, and Distoma diseases. He was succeeded as Director by Royer, who left Egypt in 1860 and whose chief writings were on elephantiasis and calculi.

Theodore Bilharz was from his earliest years interested in Natural History; and after becoming qualified in Freiburg University in 1849, was appointed Prosector of Comparative Anatomy there. This position he gave up to accompany Griesinger to Egypt in 1850. At Kasr-el Ainy he was, in turn, Assistant to Griesinger, Assistant Professor of Surgery, Professor of Medicine, and, lastly, in 1856, became Professor of Descriptive Anatomy. In 1862 he accompanied Ernest, Duke of Gotha, to Massowah, where the Duchess and several members of the expedition contracted typhoid fever.Bilharz himself fell a victim to the same disease and died of it, on May 9th 1862, a few days after his return to Cairo.

He wrote from Cairo, in May and August 1851, to announce his discovery of Distoma haematobium; and his articles were published in Von Seibold and Kolliber's Zeitschrift fur Wissenschaftliche Zoologie, 1852, Band IV; and Weiner Medicinische Wochenschrift 1856, No. 4. Cobbold proposed the name of Bilharzia haematobium for the worm in honour of its discoverer, and so it is generally known to this day.

In 1854 Abbas I. became dissatisfied with his German advisers and Kasr-el-Ainy was placed under Italian influence; and Dr. Raggi and Dr. Ranzi arrived from Florence to fill the chairs of Medicine and Surgery in Cairo; but, in the following year, Said Pasha suppressed the Medical School, on the ground that it had become a trade there to deliver fraudulent certificates of ill-health exempting from military service. The students were drafted into the army, to the great grief of Clot, who hurried back from France on hearing of the death of Abbas I. "I have seen in one day the destruction of the labours of my whole life", he cried.

Said soon found he could not do without medical officers and, in September 1856, Clot had the satisfaction of formally re-opening the medical scool at Kasr-el-Ainy. He himself was compelled to finally leave Egypt for health reasons in 1858.

After 1858 the school was left in the hands of Egyptian teachers, who have not left much record of their scientific work, and we read only that Kasr-el-Ainy was used for cholera patients, in the epidemics of 1865 and again in 1883, in which year Koch discovered the comma bacillus — or vibrio — at Alexandria.

Soon after the British Occupation of Egypt the present Sanitary Department, known as the Department of Public Health, was formed with the late Dr. Sandwith and Dr. Hassan Pasha Mahmoud as Directors; and all the recent improvements in hospital and school began. Sandwith's description of the hospital, as he found it at that period, must be read in the original and it is difficult for us now to picture it as it was then. In 1884 Dr. Herbert Milton was appointed Director of the hospital and all his excellent work is of such comparatively recent date, and so evident, that it speaks for itself. He entirely reorganised the whole establishment and finally retired in 1898, when the present regime was instituted.

The Medical School was in rather a parlous state in 1883: but, fortunately the then Director, Dr. Issa Pasha Hamdy, had sufficient influence to have the present buildings erected in place of the old. But the school still languished until Yakoub Pasha Artin was appointed Under-Secretary of State for Public Instruction. He made many important changes and, in 1890, Dr Keatinge was appointed the first English Professor (of Anatomy) and became Director of the Hospital and School in 1898.

This brings us down to our own time and recent events are still too fresh in our memory to need any further recapitulation : but we must return to our original subject and try and trace the association of the teaching staff of the Hospital and School with the study of bilharziosis, since it was left to us as a legacy by our former colleague, Theodore Bilharz.

Since Bilharz and his contemporaries, good work has been done on the subject in Egypt by Sonsino, Lortet and Vialleton ; but the outstanding worker of late years has been Looss, who was an Extra Professor of Parasitology in the University of Leipzic, and came to Cairo as a special research professor attached to our school. For nearly twenty years he worked at the anatomy life-history and, to some extent, the pathology of the bilharzia worm and has left a very valuable record of work to his credit. Shortly after Looss, in 1915, left Cairo, Leiper began his researches into the life-history of the worm, which have so brilliantly succeeded in clearing up many vexed questions in the cycle of development and in giving us for the first time a connected story of its life-history. This work was largely done in the laboratories of the school and a great deal of the spade work fell to the lot of J.G.Thomson.

Among esentially *pathological* workers, Ruffer, who was formerly Professor of Pathology with us, must be mentioned ; and to him is due the credit of proving the presence of bilharzia ova in mummies and in ancient calculi. Symmers succeeded him and worked out the pathology of the peculiar bilharzial cirrhosis of the liver and pointed out the prevailing lateral-spined ova in this condition. Ferguson, who now occupies the Chair of Pathology, has us all under the deepest obligation for his illuminating investigations and has done more than anyone else to establish the true facts of the pathological changes as we see them in actual practice,and has done much excellent work in the whole subject. Nearly all our statements on the pathology of the disease are either his own work or confirmed by his later study of the subject.

Surgically, Herbert Milton first put the subject on a sound basis ; and, with his principles to guide us, and Ferguson to put us straight on questions of an essentially pathological nature, Frank Milton, Richards, and myself have endeavoured to extend our knowledge of the "pathology of the living" of this dreadful disease, to determine the limitations of operative interference, and generally establish the proper principles of its surgical treatment.

Medically, not a great deal has been done, as medical treatment must necessarily be so purely symptomatic ; but, quite recently, Day has carefully investigated the blood changes in the disease and also initiated some experiments in the treatment of the earlier manifestations by intravenous injections of microcidine.

PLATE 43.



Fig. 1.—A coupled pair of Bilharzia haematobium. Fairley.



Fig. 2.—A similar specimen. Microphotographs by Dr. Anis Bey Onsy.



Fig. 3.—Microphotograph of section of bilharzial tissue showing several pairs of worms in situ. Looss.

THE BILHARZIA WORM. The adult bilharzia worm is one of the distome trematodes and is distinguished from the majority of this group by having male and female separate individuals, and the absence of a definite muscular pharyngeal bulb at the commencement of the oesophagus (Leiper). The male worm is about 1 c.m. long, white in colour, cylindrical in shape with tapering extremities. An oral and ventral sucker can be seen. The body of the worm is not really cylindrical, but thin and flat, and the lateral margins of the body are folded towards the ventral surface to form a long open canal, the gynecophoric canal, in which the female lies during the period of sexual activity. The male worm is studded with multitudes of tiny papillae each tipped with strong bristles. The female is much longer and thinner than the male, and may be found lying within the gynecophoric canal of the male with its extremities protruding, or it may even be completely contained within it.

The *minute structure and anatomy* of the adult worms must be studied in special treatises on the subject; but the opportunity must frequently be taken to examine the worms in their usual habitat — the portal vein or its tributaries — as well as in infected tissues, and to familiarise oneself with its naked-eye appearances. These adult worms are found especially in the portal vein and also in its tributaries within the liver. Many more are found in the mesenteric veins and their communications, and in the veins in the submucous tissue of the bladder and rectum or other parts of the intestine or genito-urinary tract. By way of the anastomosing vessels with the systemic circulation, some worms may be washed over into the main circulation and become blocked in dilated veins in practically any organ or tissue throughout the body, and they may also be discovered in the deeper parts of any bilharzial new growth or deposit.

The *ova* are of a blunt spindle shape, about 0. 16 mm. long on an average, and are encased in a thin shell. Leiper's recent researches have established the fact that there are two distinctive forms of bilharzia, characterised by a striking difference in the appearances of the spine of the ovum. That developing through the Bullinus group of snails and especially confined to genito-urinary bilharziosis, has a well-marked terminal spine; while that developing through the medium of Planorbis boissyi and affecting mainly the intestinal tract, has the spine well on the lateral border of the ovum.

The ova may be *laid* anywhere in the route taken by the female worm from the liver downwards; but are especially abundant in the neighbourhood of the submucous tissues of the bladder or rectum, or in whatever part of the genito-urinary or intestinal tracts fully mature female worms may find their permanent lodging. Further, being laid anywhere in the portal blood stream, they may be widely distributed throughout the various organs and tissues of the body, by way of the numerous anastomoses with the systemic circulation.

The fully developed and properly fecundated ovum contains a living *miracidium or embryo*, which, if the ovum is deposited in a proper medium, water for preference, assumes very active movements, within a few minutes bursts its containing shell, swims freely about in the water and is then ready to enter its appropriate intermediate host. Many of the ova do not reach the miracidium stage but die, dry up, and become calcified

in the tissue in which they are deposited; and many more, after being hatched, never reach their intermediate host.

The *pathological lesions* due to bilharzia are produced by the presence of the worms and their ova in the tissues ; but, before proceeding to the description of these effects, we must briefly trace the *life-history* of the worm and see how it comes to be in the body.

We have noted that the ovum for its further development must contain a living embryo. When the ova are passed from the body in the urine or faeces a large number will dry up and the contained embryo will die and no further development results. In Egypt, however, the ova have many opportunities of being passed into water, or soft liquid mud, and in this event the embryo becomes very active, twisting and lashing about, till finally it ruptures its shell and lies free in the water. Thence it finds its way by that extraordinary intuition, which distinguishes many other animals in this stage of their development, to the secondary host in which it is to undergo the next stage in its life-cycle. In the case of bilharzia ova this host happens to be a small fresh-water snail, which infests the grass and vegetable matter in and beside the ponds, water-courses or canals throughout the whole country.

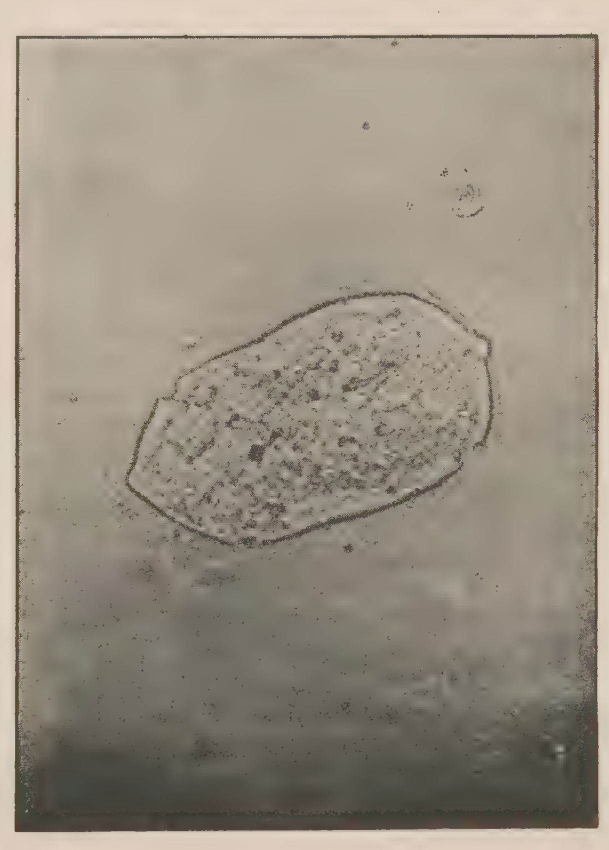
The anatomy and pathological effects of bilharzia have been worked out in great detail by Looss, and those of us who remember his painstaking accuracy and his skill in delineating what he saw, know how to give his work its true value. Failing to find any intermediate host, in spite of numerous researches among snails and other likely animals of Egypt, he put forward the doctrine that man was his own intermediate host. This view was very generally accepted and so the problem of the missing link in the chain of development remained unsolved for many years. It was left for Leiper, fresh from a series of investigations in the Far East on a similar subject, to re-open the entire subject and investigate it all anew. He had succeeded in elucidating the whole story in Japan and came to Egypt fully prepared to find the same conditions existing here. He found everything just as he had anticipated. The result has been a clearing up of what had been for many years a complete mystery, and now we can at last write "finis", or as we would say colloquially "khallas"(خلاص), to the chapter first opened by our former colleague Bilharz in 1851.

We must now endeavour to give a short digest of Leiper's discoveries concerning the further stages in the life history of the worm; but strongly advise all interested in the subject to study the fascinating story in Leiper's original papers published in the Journal of the Royal Army Medical Corps for July and August 1915 and subsequent issues, and elsewhere.

Development of Bilharzia in intermediate host. Leiper thus sums up the life cycle:— The ovum, which is laid by the adult female within the body of man must, for its further development, contain a living embryo, or miracidium. When the egg is hatched, as above described, the embryo swims freely about, by means of its cilia, in the water and enters the particular snail which serves as an intermediate host for it in the further development of the worm, finds its way to the

PLATE 44.





This plate represents the life-history of Bilharzia haematobium : with its terminal-spined ovum, its free-swimming miracidium, a collection of Bullinus snails, and the characteristic cercaria of this variety of the worm.

The upper picture is after Leiper : the two lower are from preparations made by Dr. Anis Bey Onsy and photographed by him.

liver and there becomes a sporocyst. From this sporocyst secondary sporocysts develop and increase to such an enormous extent that the whole of the liver of the snail becomes infiltrated with thin-walled tubes. Within the sporocysts large numbers of bifid-tailed cercariae develop. These are not infective until they are fully grown and naturally discharged from the snail. The injection of large quantities of teased infected liver under the skin results in very slight infection, and often in none, as the cercariae are not yet fully grown.

The next stage is that the infected snails discharge living fully-grown cercariae into the water; and these may easily be seen in active movement as tiny glistening flakes if the water is examined in a clear glass flask.

Experiments made with mice and other animals placed in such infected water, show that infection takes place directly through the skin, or through the mucous membrane of the mouth, and presumably through any other exposed mucous membrane as well.

Leiper thus describes his experiments which established the different modes of infection, in animals submitted to the risk of infection from water heavily infected with bilharzial cercariae:— "Four sooty monkeys, which had been taken out with the Mission—to Egypt—in January 1915, and kept in separate cages in the laboratory until the experiment was completed, were subjected to infection with bilharzia cercriae. In three cases the infected water was poured into the bottom of the cages and the monkeys were consequently exposed to infection through the skin of the hands feet buttocks and tail. The fourth monkey was fed for a day or two on dry food only and then allowed to drink from a cup, containing food and water swarming with bilharzia cercariae. Some effect, probably a pricking sensation, was produced almost immediately; for the monkey began to pull down the lower lip, to rub the mucous membrane of the mouth, and in other ways to indicate that the drink had not been pleasurable. After a second experience on the following day the monkey refused to accept water out of a cup, although thirsty. The four monkeys eventually died and all showed a heavy infection with bilharzia. The monkey infected from drinking water showed earlier and much more intense symptoms than the others. This experiment showed that, in bilharzia, infection may be both oral and cutaneous. As in ankylostomiasis there is little doubt, however, that the infection enters through the skin in the bulk of cases."

Further, as Brock has pointed out, the chances of infection are much greater in bathing than in drinking, because under the former circumstances a much larger quantity of water comes into contact with the body.

With special reference to the infection by skin Leiper writes :- "If a young rat or mouse be suspended in a large test tube containing water full of bilharzia cercariae, these cercariae can be seen to approach and fasten on the limbs and body of the animal. When the animal is removed half an hour later there remain in the fluid only a few cercariae and a large number of detached tails. A young mouse so immersed for half an hour was killed and subsequently embedded whole in paraffin. Sections

of the body and the limbs showed the cercariae at all stages of entry. They were found in the act of passing through the unbroken skin and not through the pores or hair follicles".

Leiper found experimentally that certain monkeys, white rats, desert rats, mice, and guinea pigs, were all susceptible to infection from bilharzia.

Development in definitive host. Leiper's experiments were carried out with mice, but it is reasonable to infer that the same changes occur in man during infection.

The cercariae is really a young adult provided with a larval appendage. At the moment of infection the tail is discarded and the body burrows into the lymph and blood systems whence the liver is reached. In the liver the cercarial body undergoes gradual growth and differentiation. The sexes are undifferentiated in the cercariae, unless a marked difference in size between cercariae discharged from the same snail may indicate there are male and female-producing sporocysts. The sexes are first distinguished by the broadening out of the males in the early stages of their growth in the liver. The female begins to produce eggs in from six to ten weeks after infection. The series of changes from the cercariae to the fully developed sexually mature adult is well seen in the accompanying photograph.

In the experiments on monkeys the animals began to pass ova in from four to six weeks after being infected.

In the course of his investigations Leiper proved that there are two different forms of bilharzia, passing the intermediate stages of their development in two different kinds of snails, giving rise to two different cercariae, and still further characterised, when they reached adult life, by laying two different sorts of ova.

Briefly, the ***bilharzia haematobium,*** the commonest variety in Egypt, goes through its intermediate stage in bullinus dybowski, bullinus contortus, bullinus Innesi, and probably other snails of the same kind; has a cercaria, in which the body and the tail are nearly equal in length, and without eye spots or cuticular keels along the bifid portions of the tail; after its full development lays terminal-spined ova; and particularly affects the genito-urinary tract.

The *bilharzia Mansoni* is not so common in Egypt as the other form, goes through its intermediate stage in planorbis boissyi; has a cercaria in which the tail is considerably longer than the body and has two eye spots and cuticular keels along the bifid portions of the tail; after its full development lays lateral-spined ova; and particularly affects the gastro-intestinal tract.

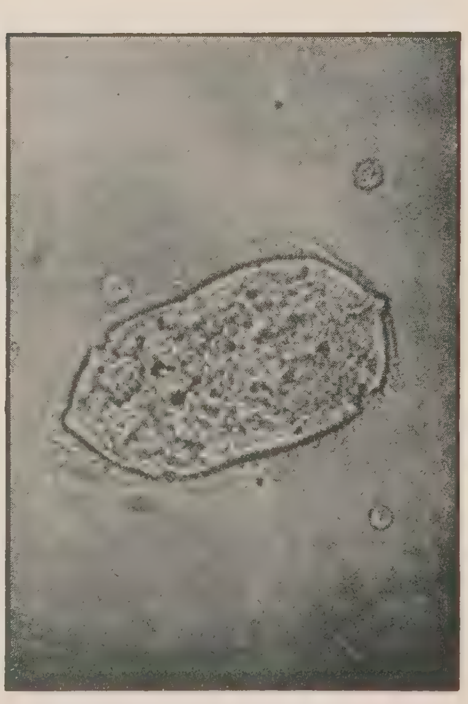
Leiper has further definitely proved that in no case do both varieties of cercariae arise from the same intermediate host.

The *adult worms* reared from these two sources show constant and readily ascertainable morphological differences. Thus, *bilharzia haematobium* has four or five large testes and a short caecum, and the female has a long uterus which contains many eggs at a time. The *bilharzia Mansoni* has eight or nine testes and a long caecum, while the female has a

Erratum :—The upper pair of snails are *planorbis boissyi*, the intermediate host of bilharzia Mansoni in man in Egypt : the middle pair are *melania tuberculata*, and the lower *planorbis mareoticus*, both of which species are believed to be the intermediate hosts of a form of bilharzia occurring in aquatic birds but not in man.

PLATE 45.





This plate represents the life history of Bilharzia Mansoni; with its large lateral-spined ovum in faeces, its miracidium, a collection of Planorbis snails, and the characteristic cercaria of this variety of the worm.

The upper picture is after Leiper: the two lower are from preparations made by Dr. Anis Bey Onsy and photographed by him.

short uterus with only one or two eggs in it at one time, and in the course of its infection of the human body gives rise to a heavy deposition of granules of black pigment in the liver. Further, the males of *bilhazia haematobium* appear to leave the liver early and pass down into the finer branches of the mesenteric vessels before they reach maturity. The females found in the gynecophoric canal are diminutive. The males of *bilharzia Mansoni* remain in the liver until the females in copula begin to lay their eggs, and large numbers of lateral-spined eggs are frequently laid in series by coupled worms in the veins on the edge of the liver. Thus the lateral-spined ova found in the liver in bilharzial cirrhosis are probably actually laid there by the adult worms and not carried back into it from mesenteric veins (Leiper).

It will thus be seen that, *for water to be infective,* the special snails must be present, and a sufficient number of weeks must have elapsed to permit of the development cycle in the snails to become complete. Once a snail is infected it appears to be able to discharge cercariae in large numbers into the water daily for several weeks. The infection and discharge of cercariae is especially marked during the hotter months of the year. The cercariae does not survive in water for more than forty-eight hours and most are dead in twenty-four. Thus water stored for forty-eight hours becomes harmless, provided no infected snail gains access to it; but the water of pools and slowly moving drains are fruitful sources of infection, and even the water of canals and the main stream of the Nile, as the cercariae may travel a considerable distance from its parent snail during its allotted span of life. Isolated wells in the fields deriving their water from the subsoil are not infective as no snails are found in them.

I make no apology for thus quoting Leiper's papers in his own words, and at some length, as his work marks the most important event in the history of bilharzia since its original discovery; and it is a great satisfaction to know that his investigations have been so completely successful after so many years of doubt and uncertainty.

Having thus got to know and recognise the worm in which we have such a proprietary interest, we must now describe its *pathological and clinical effects in the human body.* We shall first give an account of the *general* results of bilharzial invasion and the pathological changes it produces; and then trace the progress of the disease in the intestinal tract, leaving the consideration of genito-urinary bilharziosis for a later section.

The general effects of bilharzial infection. Among our fellaheen patients it is practically impossible to obtain any history of their earliest symptoms; but we have lately had the opportunity of observing the early clinical and pathological effects in the persons of soldiers who have become infected in Egypt. (This question is dealt with more fully with diseases of the rectum and anus). It has been found that the incubation period is very short, about a month, and the patients are admitted to hospital suffering from all the symptoms of severe fever of an irregular type, reaching often to 40° C. (104° F.) or rather more, with acute abdominal pains, rigors, profuse sweatings, and, invariably, pulmonary congestion.

Even at this stage lateral-spined ova can be found in the faeces and in the mucus from the rectum and there are marked intestinal irritation symptoms, with diarrhoea and the passage of dysenteric-like stools with much blood-stained mucus. Manson describes very similar symptoms as the result of infection with *schistosomum japonicum*, with a history of fever and an urticarial eruption with pulmonary congestion. Then, after the lapse of several weeks, intestinal troubles with dysenteric diarrhoea with blood and mucus in the motions, enlargement of liver and spleen and, later, intense anaemia, ascites, wasting, and progressive debility.

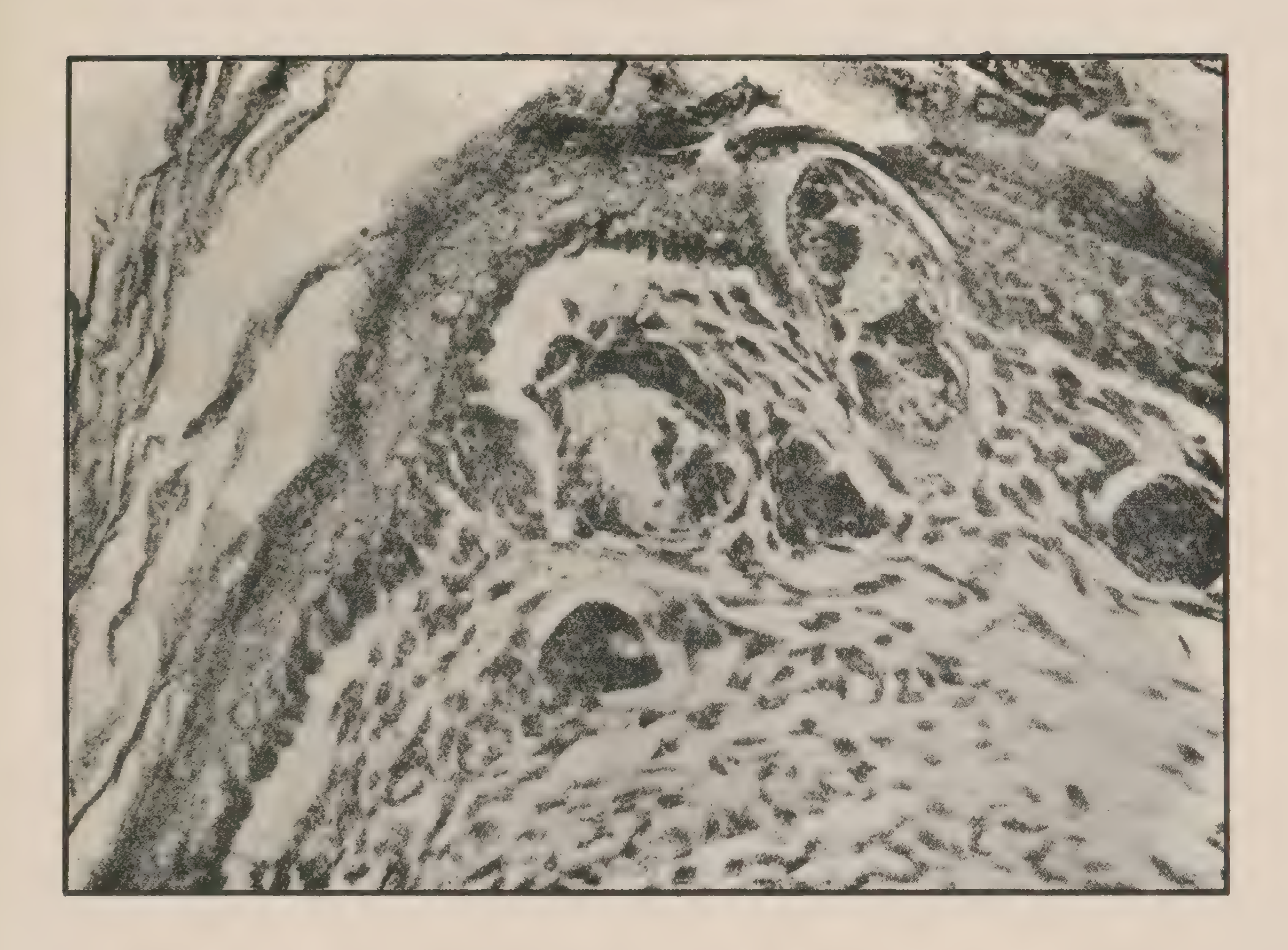
Until these early symptoms manifest themselves we have no evidence that infection has occurred, as the incubation period is quite free of indications, though the examination of the blood may afford important proofs of a parasitic invasion. Further investigations on this question by Fairley will be detailed in the section on diseases of the rectum.

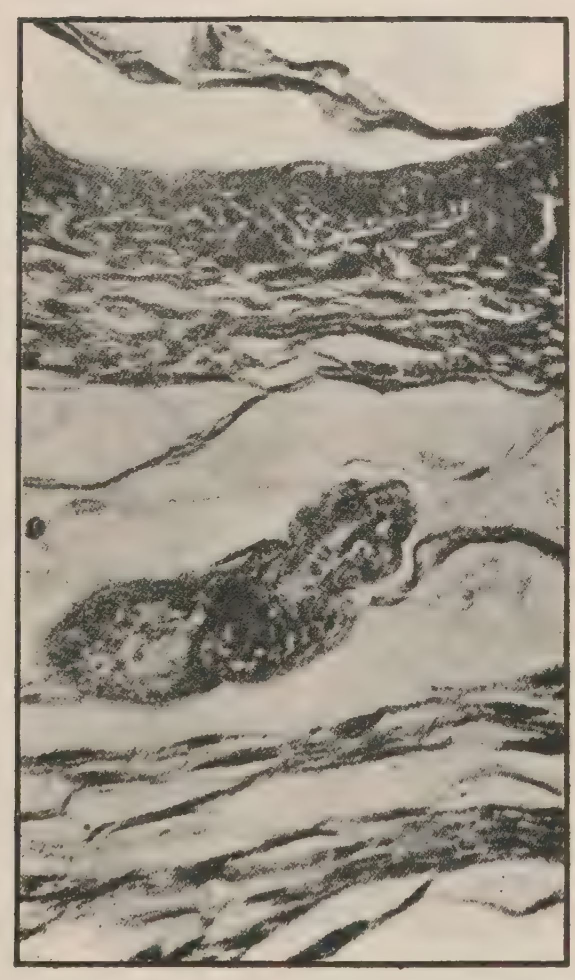
In a very instuctive paper in the Lancet of Nov. 11th, 1911, my colleague, Day, has reviewed former work on the subject and published his own results on the *blood changes in bilharzial infection;* and we must now give a short summary of this part of our subject before proceeding to the further consideration of its pathological effects.

Day finds that the presence of bilharzia worms in the blood-vessels causes a slight leucocytosis and a marked increase in the numbers of eosinophile and large mononuclear cells. The polymorphonuclear leucocytes are diminished while lymphocytes are unaffected. His average totals show that the total number of leucocytes is 9476 with the following percentages :- Polynuclears 45.3 %, lymphocytes 21.4 %, mononuclears 9.5 %, eosinophiles 23.7 % The eosinophilia appears to be due to the products of metabolism of the bilharzia worm which are excreted directly into the blood of the host; and it can be artificially produced by the injection of dead worms or hatched embryos. Examination of the area into which such injections are made show a dense infiltration with eosinophiles. Such local accumulation explains the presence in bilharzial urine of eosinophiles in much higher proportions than in the blood. Conversely, when the disease is of limited extent the removal of bilharzial tissue containing worms will lower the eosinophilia. Thus, a boy with extensive disease of the penis and perinaeum had the para-urethral infiltration excised with a marked effect on the blood within a week. It appears that the degree of eosinophilia and other blood changes are roughly proportional to the intensity of the affection, provided the patient's general condition is good.

At a later stage in the disease anaemia become a marked feature. The constant loss of blood, due to the discharge of ova through a mucous membrane, causes a secondary anaemia proportional to the duration and severity of the haemorrhage. Bilharzial disease of the intestine is especially apt to cause anaemia on account of the tendency to septic infection and diarrhoea. The vegetable diet of the Egyptian predisposes him to anaemia and the average haemoglobin percentage is under 90 in health, while in those infected with bilharzia it falls to 70, though the number of red cells is but little reduced. The anaemia is distinctly of the chlorotic type with a low colour index, and nucleated red cells are only occasionally found.

PLATE 46.







Three sections showing the passage of the cercariae through the skin. The tail is lost very early and the lower pictures represent the cercariae deep in the tissues. From Leiper.

When the cases of bilharziosis become septic the anaemia becomes much more marked, and, as compared with early aseptic cases, the leucocytosis is higher, from an increase in the polynuclears, but the eosinophilia is much reduced. The lymphocytes and mononuclears are unaffected. The haemoglobin percentage is still further reduced in extreme cases, falling even to as low as 18.5 per cent, and the red cells are also considerably reduced.

The association of other diseases, such as anchylostoma, Egyptian splenomegaly, and pellagra, also increase the anaemia and materially alter the characteristic leucocytic change.

The symptoms just detailed and the blood changes are the *earliest effects of bilharzial infection;* though among our fellaheen patients we generally see only the much later effects, which are due to the presence of the worms and ova in the tissues. The worms play a very secondary part, the true irritating agents being the ova.

We must hark back a moment to General Headquarters — the portal vein — into which the young adult worms are passed and from which they work their way, against the blood-stream, throughout the whole portal circulation; but especially to the veins in the submucous tissue of the bladder or rectum, though they may go to any other part of the genito-urinary or intestinal tract. Arrived at their destination the females lay an abundance of eggs and soon the connective tissue under the mucous membrane and throughout the different layers of the viscus is packed with ova, all endeavouring to make their way to the mucous surface, from whence they may be discharged and so have an opportunity of completing their life history. The essential effect of the ova in the tissues is irritation, producing, on the one hand, an overgrowth of epithelium, which often increases to such an extent as to form deep pits and tubes as infoldings of the surface, or gives rise to projecting papillomata of various sizes and diversity of shapes. In the connective tissue, on the other hand, the effect is to produce an intense round-celled infiltration; which, being a form of granulation tissue, tends to break down and soften or, more generally, to form a particularly dense fibrous tissue which may pervade the various coats of the organ. When this process is carried to an extreme degree, the presence of an excessive cell infiltration may terminate in sarcoma; but more frequently the firmer fibrous malignant growths prevail and and a stony-hard scirrhus cancer supervenes.

The *earlier degrees of bilharzial infiltration,* with ova in and under the epithelium of a mucous membrane, present a very characteristic appearance. The mucous membrane is a dull-red colour, often swollen to such an extent that it may be thrown into folds, the whole aspect being like that of a rich pile velvet with a peculiar friable-looking surface. The swollen membrane is intensely hyperaemic, soft to the touch and easily abraded by pinching between the fingers, and slight bleeding is very easily provoked. This infiltration of a mucous membrane may be present in isolated patches or it may involve its whole extent; and I have felt such a lining membrane with a sound like a series of coils of sausages within the bladder. Microscopically, in such a mucous mem-

brane, there is great epithelial activity with hyeraemia and a general round-celled infiltration, and numbers of ova in and between the different cells. Many of the ova are calcified. So intense may be the inflammation and infiltration that small abscesses may be seen forming underneath the mucous membrane.

At a rather *later stage* this swollen mucous membrane takes on a light-brown or dark-yellow colour, which I have elsewhere described as a wet sea-sand appearance, due to myriads of calcified ova in its substance, and the original dull-red colour is lost, or nearly so. On such a membrane the hyperaemia may be much more localised and patches of deep extravasations of blood appear.

With the continued irritation of the ever-present ova and their increasing numbers, a still more intense multiplication of the cells of the epithelial layer is evidenced by the *formation of papillomata,* of literally all sorts and sizes, but all covered with the same swollen hyperaemic mucous membrane described above. These papillomata and their connective tissue pedicles are more tightly packed with ova than ever; and some of the ova can be seen forcing their way through between the cells or streaming out from the surface of a superficial abrasion, which is caused by a molecular ulcerative process from the destructive pressure of the massed ova. Some of the papillomata appear to be simply made of ova. So great may be the pressure of ova in the papilloma that a more extensive cutting off of blood supply occurs, from pressure on the main vessels in the pedicle, and finally the papilloma sloughs off, leaving an irregular rounded punched-out ulcer in the mucous membrane, which forms one of the lesions associated with bilharzial dysentery. Ulceration is not, however, at all a marked feature in the pathology of biharziosis of mucous membrane.

The *changes deep to the mucous membrane* due to cellular infiltration go on *pari passn* with those on the surface; and the worms may be seen lying in the dilated veins of the deeper parts of the submucous tissues and in the intermuscular planes.

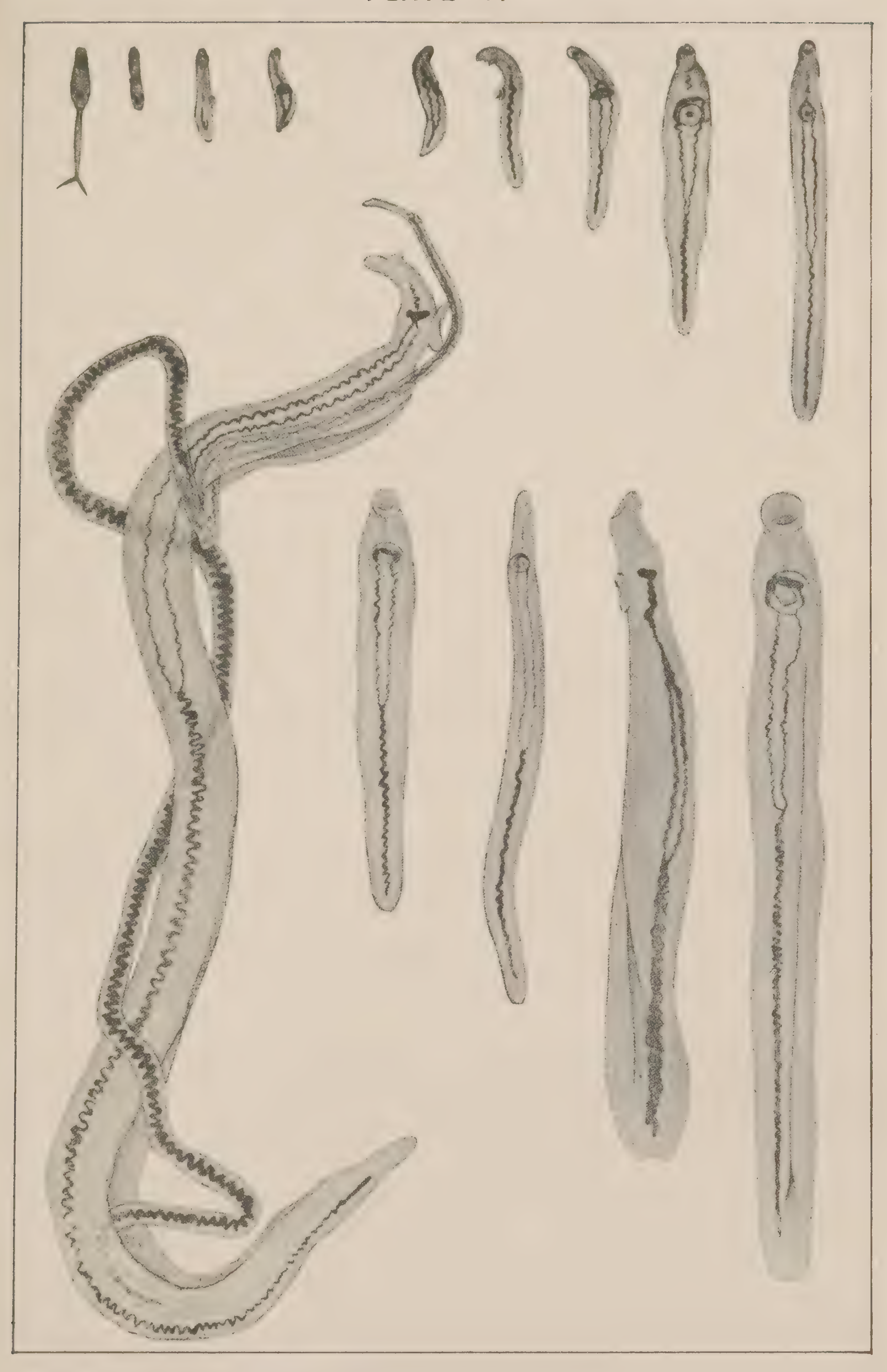
The further details of the pathological processes can best be described in connection with this disease as it affects the different systems and tissues.

BILHARZIOSIS OF THE GASTRO-INTESTINAL TRACT. To obtain a clear picture of the distribution and characters of bilharziosis, as it affects the intestinal tract, we must consider it both from a pathological and regional standpoint.

Pathologically, we recognise several different changes, varying in severity in different portions of the digestive tract.

1. General infiltration of the mucous membrane with or without the formation of papillomata. This is the commonest pathological change in the disease and may be seen in the rectum, with the sigmoidoscope, at a very early stage of the infection, when the earliest symptoms already noticed have just begun to manifest themselves. There is the same general

PLATE 47



The phases of development of the Bilharzia worm from the cercaria to the adult state. From Leiper.

hyperaemia and intense infiltration with round cells and ova we have just described, and its particularly friable surface may be easily abraded and give rise to blood in the motions; while the hypertrophy of the mucous glands throughout the affected area covers the whole surface with masses of thick viscid mucus, which are passed with the blood and account for the marked dysenteric symptoms, which are so constant a feature of bilharzial infection of the intestine.

This infiltration throughout the thickness of the mucous membrane may be confined to a relatively small area, or may involve a considerable length of the intestine: and, in places where such a thing is possible, the swollen hyperaemic redundant mucous membrane may be prolapsed externally, as occurs in its most characteristic form in the rectum.

In rather older cases this hyperaemic mucous membrane may be infiltrated with ova that have become calcified and take on the wet sea-sand appearance, already mentioned, with its pale brownish-yellow colour. Worms will be found in the deeper parts of the submucous tissues or deeper still in the bilharzial infiltration of the other coats or in that between the layers of the mesentery or meso-colon.

In the midst of an area of this kind, or sometimes without any relation to it, *papillomata* may occur. They soon become quite large and irregular in shape and may be scattered broadcast along the length of the intestine, especially in the large gut. They are sometimes seen arranged in a circular ring around the circumference of the gut; and Ferguson supposes that this is due to the deposit of worms and the laying of ova in one large vein which encircled the intestine at this point. These papillomata often form markedly pendulous tumours which may be massed in considerable numbers in small sections of the gut. They may be protruded from the anus, when they occur in the rectum, on the least straining, or even be continually outside with a considerable ring of softened infiltrated mucous membrane.

The papillomatous change is very common throughout the intestine in bilharziosis. Papillomata may occur even in the stomach, and all the varieties and sizes are especially met with from the caecum downwards. Whenever they occur in large groups, the underlying wall of the intestine is much thickened and infiltrated throughout all its layers, the infiltration even extending to the connective tissue between the layers of the mesentery or meso-colon.

Sometimes the papillomatous change is not so marked; but irregular elevations, consisting of bilharzial tissue of firm consistency, project above the level of the mucous membrane and are covered with a thickened epithelial layer of similar characters to that of the mucous surface of the papillomata. Beneath these *sessile masses* there is always considerable infiltration of all the coats of the intestine and of the mesenteric or meso-colic connective tissue.

2. *Ulceration from necrosis of pedicles of papillomata.* In certain situations, particularly in the descending colon, Symmers describes a condition in which a whole series of papillomata have become encircled with a ring of gangrene round their pedicles, which ultimately leads to the sloughing-off of the papillomata and leaves a rounded clean-cut ulce

with rather undermined edges. This appearance is at first sight much like dysentery and in some of the ulcers there appears to be a secondary infection with amoebae. It is highly probable that the primary lesion is amoebic dysentery occurring in a bilharzial intestine (Ferguson). In any case, the symptoms they give rise to are essentially dysenteric. These irritative symptoms, generally known as *bilharzial dysentery*, may be more appropriately explained by the presence of the bilharzial infiltration of the mucous membrane with the outpouring of much mucus from the hypertrophied glands, and the papillomatous change with its added irritation as well. Erosion of the surface of both infiltrated mucous membrane and infiltrated papillomata must also contribute to the symptoms and account for some of the blood in the motions.

3. *Bilharzial tumours of the large intestine.* Under this title is included the most formidable bilharzial condition occurring in the intestine. The striking feature of this change is an enormous thickening of all the coats of the affected part, and often there is a very marked contrast between the massive infiltration and the comparatively healthy gut on either side of it. So extensive is the infiltration and thickening that hard irregularly-rounded freely-movable tumours are produced, usually in association with irregular attacks of bilharzial dysentery. Working from within outwards, the lumen of the gut is filled and often much distorted by masses of papillomata with very thick pedicles, and sometimes sessile masses may occur also. The mucous cap of the papillomata is very thick and the pedicle can be traced to the submucous layer, beyond which a tremendously thickened and hypertrophied muscular layer stands out very prominently. Beyond this again is a dense infiltration which thickens the serous coat, produces great swelling and thickening of the appendices epiploicae, and forms a dense massive thickening and induration between the layers of the meso-colon; and this, as well as the localised thickening of the gut itself, largely contributes to the formation of the tumour. Scattered on and under the serous coverings of the gut and its mesentery are innumerable firm nodules, of size varying from that of a miliary tubercle to a broad bean, and all the mesenteric glands in the neighbourhood are enlarged with firm infiltration. Similar nodules may be seen also on the parietal peritoneum over the tumour; and at first sight the general appearances resemble those of a sarcomatous mass in the gut, with secondary infection of mesenteric glands and a general sarcomatosis of the peritoneal cavity. Microscopical section shows that these masses and glands consist of bilharzial tissue and are full of ova.

The lumen of the gut is much blocked by the tumours, but I have never seen obstruction caused by this condition, probably because it is all so well lubricated with mucus, though, from the enormous muscular hypertrophy, it is evident that a very considerable effort is required to drive on the faeces.

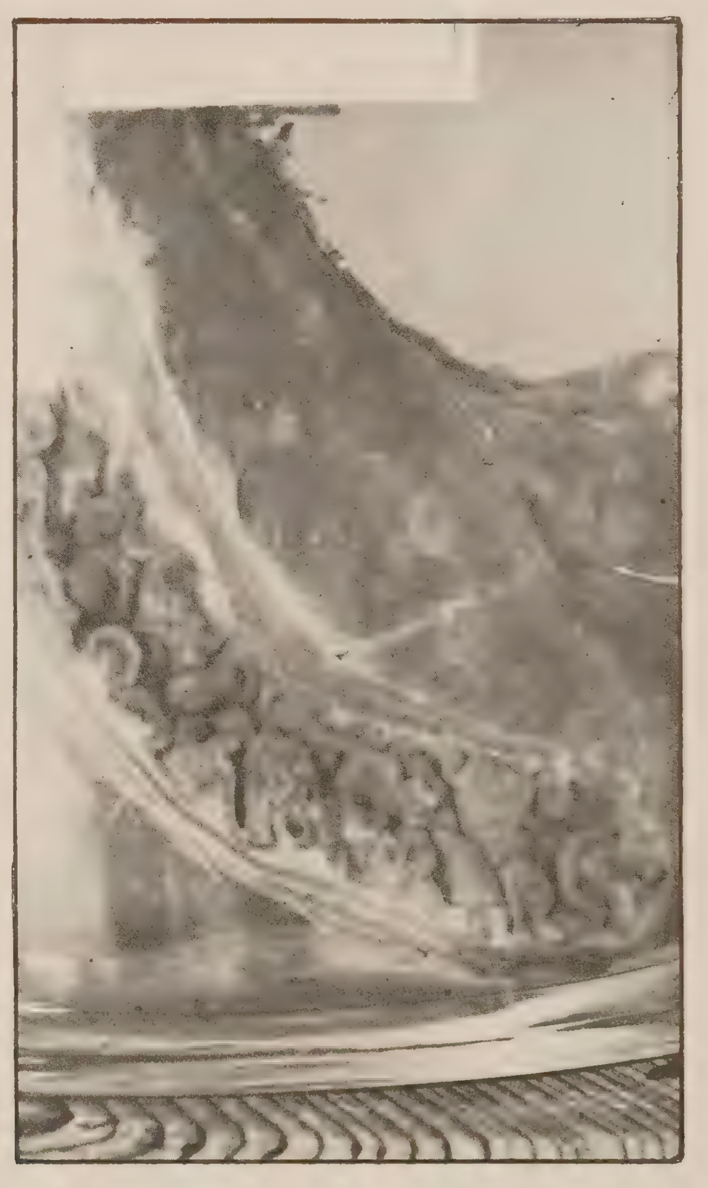
These masses occupy a section of the gut from about four to eight inches in length and are found in and around the caecum, in the transverse colon, and in the sigmoid flexure especially, but there is no reason why they should not occur in other situations in the course of the large intestine.



Bilharzial papillomata of intestine.
Path. Museum. Cassell.



Amoebic dysentery in a bilharzial intestine.
Path. Museum. Cassell.



Rectal Bilharziosis with infiltration of the meso-rectum with a dense bilharzial tissue.
Path. Museum. Cassell.

Sometimes the *appendix* with the meso-appendix is affected and included in one large mass with the caecum and all the adjoining structures; but it may also be the seat of a severe bilharzial infection on its own account and give rise to symptoms of chronic appendicitis, or even form abscesses, presenting anteriorly, or in the loin behind the caecum if the appendix is retro-caecally placed.

These massive tumours, especially when around the caecum, very much resemble sarcoma and it is only when the gut is incised and the papillomata exposed to view that the diagnosis can be made with certainty. Before the gut is opened the papillomata feel through the thickened walls like stones in a soft leather bag.

The association of bilharzial dysentery with lateral-spined ova in the faeces, and a hard mass anywhere along the course of the large intestine is very characteristic of this condition and an exploratory laparotomy is indicated.

4. Bilharzial rectal fistulae. In extreme cases of bilharziosis of the rectum, multiple fistulae may form all round the anus and extend out on to the buttocks, forward into the perinaeum, or even on to the front of the abdomen. They originate in much the same way as similar fistulae in the urethra (which will be described in detail later) as a bilharzial ulcer in the rectum, which gradually deepens by septic infection and begins to track along the subcutaneous tissues in the neighbourhood. From the destruction of tissue by these fistulae and the presence of bilharzial fibrous tissue and its subsequent contraction, a considerable degree of false elephantiasis by lymphatic obstruction may occur ; and epithelioma may develop in the site of old bilharzial irritation and ulceration of the margin of the anus. Some of these fistulae around the anus and perinaeum may originate from bilharzial deposits in the subcutaneous tissue, quite independent of the bilharzial infection of the mucous membrane of the rectum, and some may come directly from the urethra.

Regionally there is no doubt that the greatest infection occurs in the rectum and the large bowel ; but severe lesions may occur at any part in direct venous connection with the portal vein.

Cases have been reported of a cystic swelling in the mucous membrane of the *stomach,* the walls of which contained bilharzia ova ; and ova have also been found in an infiltration of the deeper coats of this organ, and in nodules on its serous surface.

The *small intestine* is but little affected, except in the lower part of the ileum, which may contain papillomata, or may be firmly incorporated with masses around the caecum and appendix.

All the various changes described above are seen at their best in *the large intestine.* Patchy general infiltration of the mucous membrane is common, papillomata abound, a few ulcers from the sloughing of papillomata may be seen, and massive tumours of caecum, colon or sigmoid, frequently present themselves in advanced cases. Mention has already been made of the involvement of the appendix in these advanced infections; and one most specially bear in mind the dense infiltrating tissue between the layers of the peritoneal attachments of the gut.

The disease seems to vent its spite especially upon *the rectum.* At a very early stage the mucous membrane becomes infiltrated and tiny nodules, the germs of future papillomata, may be seen and felt. Somewhat later, the mucous membrane becomes so densely infiltrated and hypertrophied that it is thrown into folds and prolapses very easily on the slightest straining. Large numbers of papillomata may grow from the mucous membrane and form great pendulous masses, which may easily be prolapsed or may even remain permanently outside the anus. Tenesmus is almost constant ; and, with the increase in the infiltration, the sphincter muscle becomes gradually destroyed, the anus becomes patulous and some incontinence of faeces occurs ; and the prolapse of much swollen hypertrophied infiltrated mucous membrane, with or without large masses of papillomata, is practically constant. Bleeding takes place with every act of straining. After some time the prolapsed membrane becomes dry and ulcerated and, from the increase in size from oedema and inflammation, reduction becomes quite impossible. In the cases with papillomata a rectal examination with finger or speculum will disclose the presence of similar growths as far as the finger can reach or the eye can see.

In certain cases quite extensive ulceration may take place within the rectum and eventually result in the formation of multiple rectal fistulae, as has been described among the pathological changes. These fistulae are very difficult to treat as they issue from several different points of the rectum and often very extensive dissections are required to excise them.

Rarely also a bilharzial ulceration around the anus may end in epithelioma, with considerable destruction of tissue and secondary enlargement of the glands in the groins.

Obstruction to the passage of faeces never occurs in uncomplicated rectal bilharziosis ; but stricture may sometimes result from the contraction of healed ulcerations within the canal. This only occurs, however, when there has been extensive destruction of tissue and much subsequent cicatrisation.

Reference has already been made to a form of *diffuse papillomatosis of the perinaeum,* occurring in association with rectal bilharziosis, due to secondary infection with spirochaetes of various kinds. (See section on Ulceration.)

Finally, the rarest manifestation arising from bilharziosis of the rectum takes the form of a *hard irregular rounded mass encircling the anus.* This mass forms quite a large tumour, the surface of which is for the most part covered with skin ; and in it are several deep epithelial-lined tracks or tubes filled with sebaceous material in a state of decomposition. These tubes do not communicate with the anus but are simply invaginations of the skin surface penetrating the substance of the tumour in various directions and not communicating with each other. The mucous membrane of the anus merges insensibly into the skin covering the mass, which is simply dense bilharzial fibrous tissue all round the anus and involving the sphincter muscles and lower end of the rectum.



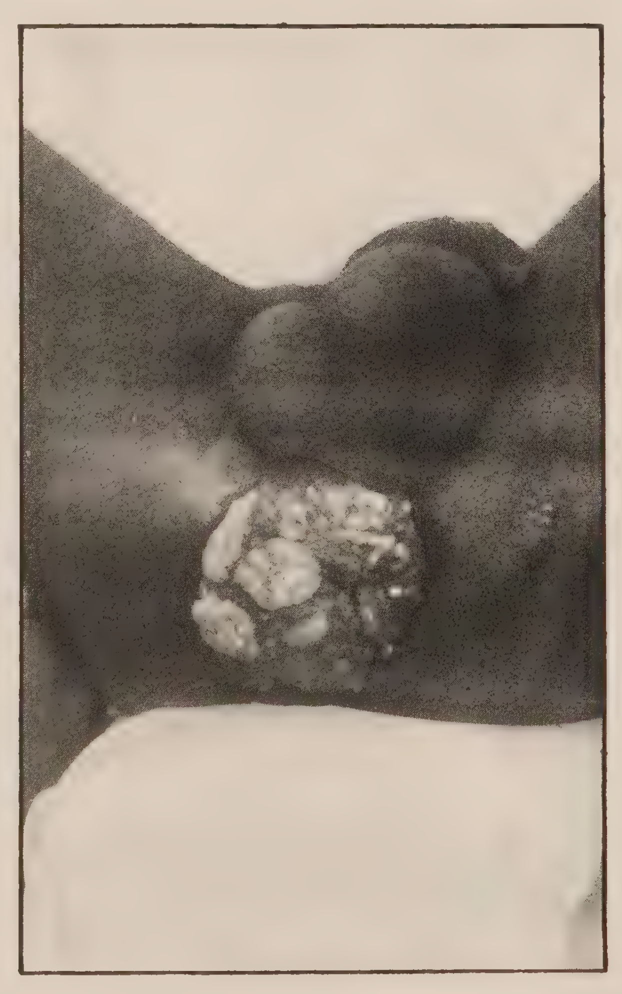
Enormous masses of bilharzial papillomata protuded from the anus. Cassell.



Scarring left after multiple operations on bilharzial rectal fistulae. Cassell.



Epithelioma of anus and rectum secondary to bilharzial disease of lower end of rectum. Cassell.



Bilharzia masses around anus and lower end of rectum. Cassell.

Symptoms of intestinal bilharziosis. Apart from certain special symptoms arising from rectal bilharziosis, the general symptoms of intestinal bilharziosis, except in the earliest stages of the infection, have nothing essentially characteristic, save the presence of ova in the faecal discharges.

These *very early indications* of bilharzial infection have been already described but, unfortunately, we very rarely see our Egyptian patients at this stage of the disease. We generally find that it has progressed considerably before it is realised that the symptoms have anything to do with bilharzia. It is far more likely to be considered a colitis or a dysentery of a chronic nature, and continue to be treated as such, until the true nature of the condition is revealed by the discovery of ova in the faeces or mucus.

The *general symptoms* as we see them are those of digestive disturbance with attacks of colicy pain, and a chronic diarrhoea with frequent dysenteric-like motions. The discovery of multiple papillomata in the rectum on digital examination will often give a valuable clue to the condition, while absolute confirmation is afforded by the microscopical finding of ova. The association of a chronic dysenteric diarrhoea, without the presence of amoebae or dysenteric micro-organisms, with a firm movable tumour about the caecum or along the course of the colon is always looked upon with suspicion in Egypt; and a rectal examination with finger and sigmoidoscope and a search for ova in the faecal discharges follow as a matter of routine. When there is no reason to suspect bilharziosis much more difficulty may be experienced and the problem is not solved until recourse is had to the proctoscope. These evidences of disordered intestinal action are not peculiar to any one set of lesions, though the variety which comes most often under *surgical* observation is that associated with tumour, which also best lends itself to operative interference.

In the moderately severe cases, in the absence of a tumour, the abdomen feels tumid and soft and there may be some general fulness, even distension, of the intestines, especially in the large gut; an appearance not unlike a mild degree of chronic intestinal stasis and probably due to a general atony of the intestinal walls. Later, when the patient is severely affected he becomes very emaciated, with a very thin and feeble abdominal wall, through which the ureters and vertebral column can be distinctly mapped out. Thickenings of the caecum or sigmoid, and sometimes other parts of the colon, may be made out, and the intestinal tube rolls easily and very characteristically under the hand. It is probable, too, that a length of ulceration of the mucous membrane would be tender on pressure but one cannot assert this positively as we have no means of confirming our suspicions. Our diagnosis, indeed, of bilharziosis of the intestinal tract — excluding the rectum — rests entirely upon the presence of certain signs and symptoms, which may be common to many other intestinal affections, and the occurrence of ova in the faeces, and, very frequently, papillomata in the rectum. In a country where this disease is so prevalent it becomes part of a regular routine duty in cases of chronic diarrhoea to first exclude intestinal bilharziosis; and always to suspect it, especially

when the genito-urinary tract also is affected. In the majority of cases both lateral and terminal spined ova are found; and, though in the earlier stages only lateral spined ova are found, it never happens that only terminal spined ova are present.

In the sigmoid flexure and the rectum we are on much surer ground and are early able to make a positive diagnosis. The sigmoidoscope will show us high up the patchy or general infiltration and swelling of the mucous membrane, the presence of papillomata or small raised masses on this membrane, and, sometimes, definite bilharzial ulcers or sloughing papillomata. Similar appearances may be seen in the rectum right down to the anus ; and here also the ulceration, with scarring or even strictures, may be seen, or the internal orifices of bilharzial fistulae. The anus may be quite patulous and, projecting from it, single tumours or masses of papillomata, or a deep ring of infiltrated mucous membrane in varying degrees of prolapse. On digital examination the presence of all these various manifestations may be confirmed ; and often many firm papillomata are felt, and others may be seen with a speculum, extending well beyond the extreme limit of palpation by the examining finger. Large pieces of swollen mucous membrane can be hooked out of the patulous anus with the greatest ease and on it may be planted many typical papillomata. When there is a permanent prolapse the diagnosis is usually quite obvious.

The *symptoms of rectal bilharziosis* are incessant tenesmus with an irritative diarrhoea, resulting in the passage of large masses of mucus and also of blood, which may be intimately mixed with the mucus or be discharged as large dark drops during the act of defaecation. At first, as we have said, there will be considerable straining ; but, later, a partial incontinence, which gradually increases as the sphincter becomes more and more stretched and, as sometimes may happen, it becomes itself infiltrated with bilharzial tissue. Very often blood and mucus are passed at very frequent intervals, without any faecal matter at all, and only a polypoid mass with a good deal of lax swollen mucous membrane is protruded. These masses of mucus are sometimes full of ova.

There is no difficulty in diagnosing rectal bilharzial fistulae or the scarring, both internal and external, they may give rise to ; and epithelioma at the margin of the anus is equally easily recognised though the real causal condition may not be so readily found. The rare rounded bilharzial mass around the anus and diffuse papillomatosis have their own special features and present no difficulty in diagnosis.

The treatment of bilharziosis in the intestinal tract is almost entirely symptomatic and resolves itself into that of dyspepsia diarrhoea and dysentery. Probably the most generally useful medicine is the hospital white mixture, which is continued till the diagnosis is confirmed by the microscope and until the possibility of some surgical procedure has been discussed.

Considering the rectum later, there are three possible operations, of uncertain value, in selected cases of bilharziosis of the large intestine. The first is appendicostomy, followed by the irrigation of the large intestine with saline solution and various astringent injections, most of which

contain tannic acid in 1 °/₀ solution. Personally, I cannot see the advantages of this operation and have never used it, as I think the same effect can be obtained by purgation, or the use of high injections through a long tube extending from the anus to the sigmoid junction.

Another proposal which has been carried out in some instances is to resect a considerable length of the most severely affected intestine, but our knowledge of the pathology of this condition holds out very little hope of relief by the removal of so small a portion of the affected intestine. Similarly short-circuiting operations, as by ileo-sigmoidostomy, have been practised without much justification or result.

Purely by accident I found that, in cases of massive bilharzial tumours of the colon, a simple laparotomy with incision into the thickened gut and re-suture of gut and abdominal wall was followed by very considerable improvement in the distressing symptoms; and also by the apparent disappearance of the tumour itself. It has now become my practice to operate in this way on all such cases in which there appears to be any chance of improvement. I cannot explain why this effect is produced, sufficient is it that it nearly always leads to a marked improvement, which justifies its adoption.

Bilharziosis of the *rectum* must be treated entirely on the merits of each individual case and every possible palliative and curative measure attempted. In the early stages dilatation of the sphincter may relieve the tenesmus and constant straining; removal of polypoid masses by ligature round their base may afford much temporary relief; frequent irrigation of the rectum with saline solution or tannic acid may give rest for a time; excision of a prolapsed ring of mucous membrane may sometimes be possible, but so often the infiltrated membrane is so soft that sutures readily cut through and a large raw area is left to slowly heal and cicatrise. On this account in cases of prolapse we usually content ourselves with removing any prominent papillomata and then making a deep semi-circular incision behind the rectum and well up into the front of the coccyx and lower end of the sacrum; then packing the wound and allowing it to heal up slowly from the bottom, as suggested by Lockhart Mummery, and our results have been very satisfactory. The very large chronic prolapses may require complete excision through all the coats of the rectum; or even an operation of ventral suspension of the sigmoid, should the general condition of the patient justify such severe measures. We have also made some attempts to promote ulceration and subsequent contraction of the walls of the rectum by swabbing with 10% solution of chloride of zinc, and again by long vertical strokings with the thermocautery within the cavity of the rectum.

It will thus be seen that our treatment at best is very unsatisfactory and only aims at relieving the troublesome affliction, as no radical measures are possible.

Bilharzial rectal *fistulae* must be treated on the accepted lines for the treatment of fistulae about the anus and rectum in general, but very extensive dissections are often necessary to lay open and remove the tortuous tracks resulting from this enterprising disease.

Epithelioma must also be treated as the necessities of the case demand, usually by excision of the anus and lower part of the rectum, after which the divided tube is brought down and stitched to the skin margin; eventually contraction occurs and quite a fair amount of control is subsequently gained. A similar operation must be done for the removal of the large circular masses involving the anal canal; and free removal of the growth by excision down to the muscles, in the case of the diffuse papillomatosis of the ischio-rectal and perineal regions. Grafting of the denuded areas must subsequently be practised.

Bilharzial cirrhosis of the liver. We have not yet found any pathological effects in the human liver from the development of the bilharzia worm in that organ; but in advanced cases of bilharziosis we sometimes meet with a peculiar peri-portal cirrhosis, which Symmers has described in the Journal of Pathology, Vol.IX, 1904. He says : "The liver is somewhat enlarged, often weighing up to 1800 grms. The surface shows a peculiar shagreened appearance, owing to a pronounced increase of the peri-vascular connective tissue, so that dull white markings appear through the capsule, forming a wide-meshed net-work with irregular quadrate pentate or many-sided areas. There is also a variable number of flat almost china-white nodules which project more or less from the capsule, particularly on the under surface of the organ near its anterior margin. These are of various sizes and are distinct growths of the capsule — perihepatitic nodules — and have no relation whatever, in appearance, structure or origin, with the hob-nail projection of coarse cirrhosis. On section the liver shows an enormous increase of the fibrous tissue around the portal canals, which is quite white in colour, and in it are embedded the mouths of the portal vessels and the bile ducts. So marked is this fibrous tissue that a section of the liver looks as if a number of white clay pipe stems had been thrust at various angles through the organ. There is nothing like an intra-lobular cirrhosis or any retraction of the capsule, and the parenchyma of the organ is homogeneous in appearance, and has a peculiar anaemic or drab colour, which contrasts very markedly with the pinkish-white of the new fibrous tissue.

Microscopically, there is great increase of the peri-portal connective tissue, especially of the sublobular and larger portal canals rather than those of inter-lobular distribution. Sometimes this tissue is arranged concentrically though generally it is in wavy or parallel fibres. Among this new tissue are seen many ova with lateral spines which may also be seen in the centre of the concentric masses of tissue. These consist of spindle cells arranged concentrically around an ovum, while at the periphery the mass passes into the more fully formed fibrous tissue which makes up the general peri-portal cirrhosis. Occasionally ova, which are generally empty, are seen in the larger capillary vessels which permeate the fibrous tissue, but none is seen lying free among the hepatic cells.

The whitish nodules on the surface are composed of fibrous tissue containing ova. In the liver lobules, the capillaries between the columns of liver cells are somewhat dilated; and in them are a great number of scattered cells which contain granules and amorphous masses of a sepia-

PLATE 50.



Fig. 1—Bilharzial cirrhosis of the liver. Path. Museum.



Fig. 2.—Microphotograph of bilharzial cirrhosis of the liver, showing many lateral-spined ova. Preparation by Prof. Symmers. P.A.

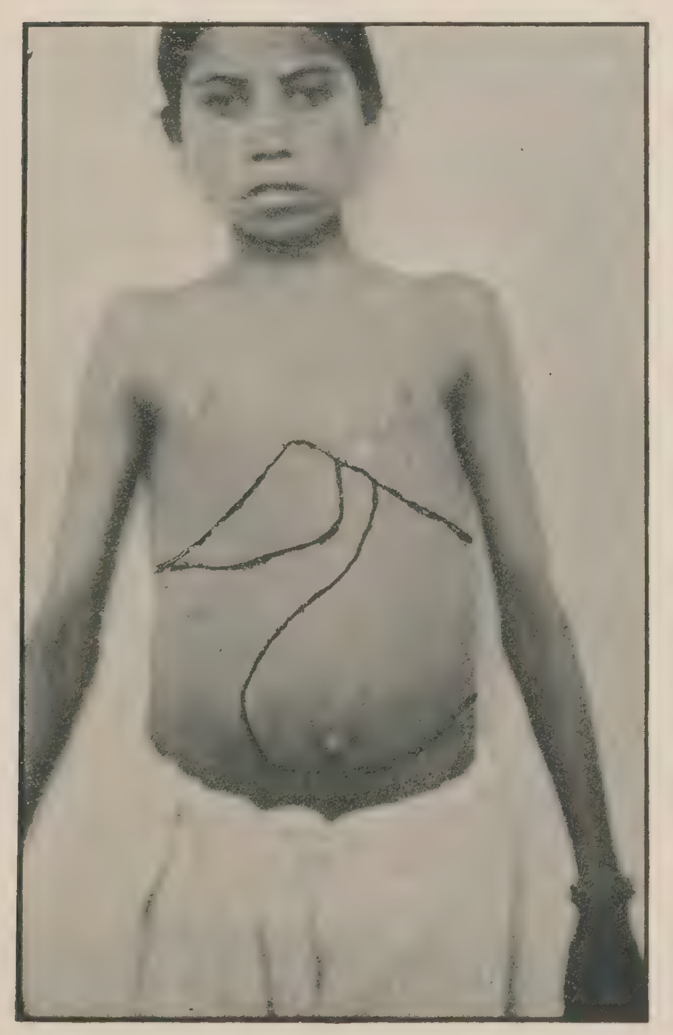


Fig.3.—Splenomegaly in a girl of 10. Splenectomy. Spleen weighed 2250 grammes.

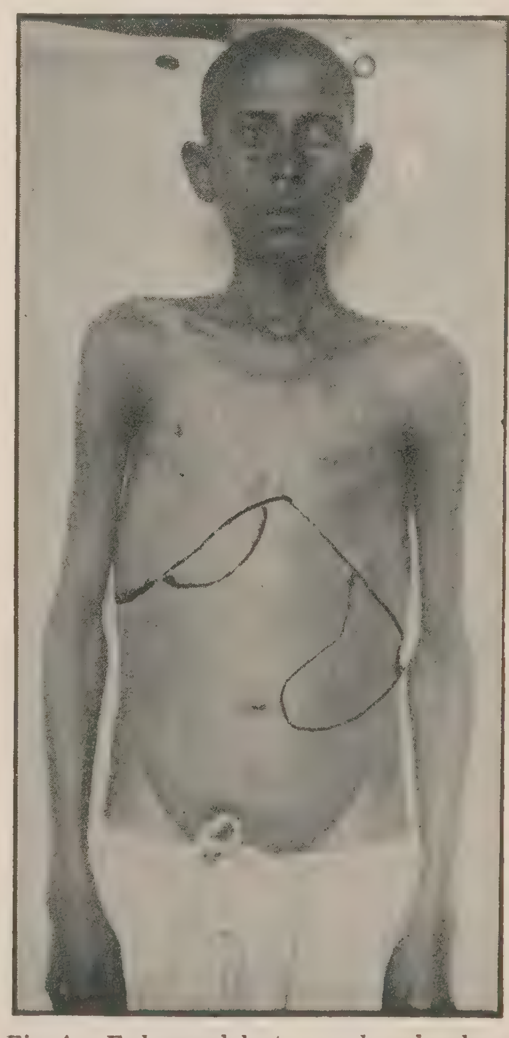


Fig.4.—Enlarged but very hard spleen and much contracted liver. W. B. C. 2500. General condition bad. The patient died a few days after this photograph was taken.

brown pigment (melanin). There is also a small amount of pigment lying free in the cirrhotic tissue, particularly in the neighbourhood of the ova shells in the young fibrous tissue."

This bilharzial cirrhosis does not give rise to any characteristic symptoms, but it probably contributes to the production of some of our numerous cases of ascites, of which the principal causal factor is advanced Egyptian splenomegaly, and which is associated with a very contracted cirrhotic liver.

In the absence of ascites and jaundice, bilharzial cirrhosis can only be discovered by the physical signs of a rather enlarged liver with an irregularly nodulated surface, its presence being presumed when evidence is forthcoming of advanced intestinal bilharziosis. No treatment is likely to be of any avail.

Bilharzial ova and infiltration occur in the *pancreas,* without evident symptoms, and also in a patchy peri-splenitis and in nodules in the *spleen.*

LOCAL PECULIARITIES OF DISEASES OF THE STOMACH AND INTESTINES. We have already referred to the extraordinary rarity of STOMACH conditions likely to require surgical interference in Egypt and have but little to add in this place. We would like to once more emphasise the fact that a case of gastric ulcer is quite an event — though we have recently had a very severe haematemesis from this cause—and to note that cancer of this organ, sometimes of the pylorus or involving almost its whole substance, provides us with the majority of our rare operations on the stomach. Nothing more than a short circuiting by gastro-enterostomy is usually possible, owing to the advanced surrounding infiltration and the involvement of the retro-peritoneal glands.

Coming to the SMALL INTESTINE, duodenal ulcer is also very rare indeed and so also is intussusception in infants, in spite of the appalling diet they are so often given. Chronic intussusception is more frequent, and I have had four or five cases occurring at quite an advanced age.

In the LRGE IANTESTINE, apart from bilharzial masses, sarcoma and tubercle sometimes may be seen in the caecum; but other malignant disease in any part of the colon is only rarely met with. Even the rectum has only a very small share of carcinoma, which is equally uncommon in the sigmoid. It is doubtful how often a bilharzia mass in the colon goes on to malignancy, but certainly not nearly so frequently as the same disease in the bladder. Volvulus as a cause of intestinal obstruction may present itself; but all the congenital and acquired dilatations of the large intestine are rare in the extreme and hardly ever sufficiently troublesome to suggest any surgical interference.

APPENDICITIS is becoming more prevalent in Egypt than formerly; but even now it cannot be said to be at all common according to English figures; as, during 1913, only 22 appendicitis operations were done in

Kasr-el-Ainy out of 1710 admissions for surgical diseases. Some years ago I collected a series of statistics from hospital admissions and post-mortem records and found only eight cases of appendicitis in 2000 patients. Day gives a record of 8 cases out of 6691 in 1906, and 6 out of 6980 in 1907, including clinical cases and autopsies.

As the patient's social condition improves and he comes to live under more civilised conditions his liability to appendicitis increases at once; and one finds many more cases among private patients, who are much more European in their habits than the average hospital patient. The reason for this immunity to appendicitis among the fellaheen is not quite evident; but they are almost entirely vegetarians, their large intestine is probably more thoroughly emptied during the act of defaecation in the squatting position, which is the universal custom, and they are not liable to attacks of influenza, or other infectious epidemics as are the town dwellers.

The clinical features of appendicitis present no peculiarly local characteristics and the disease must be studied in detail elsewhere. Our cases are perhaps more liable to come to hospital for treatment with GENERAL SEPTIC PERITONITIS, owing to indifference to former attacks, or neglect of rest and proper treatment during the acuteness of the existing attack. Several, also, cure, or endeavour to cure, themselves by the abscess bursting back into the intestine.

In the treatment of these PERITONITIS cases all the principles governing abdominal operations, already described, must be followed in every particular. If we have good reason to suspect the appendix as the cause of the peritonitis, the abdomen should be opened through the outer edge of the right rectus and the appendix removed, if possible, by a simple ligature round its base, no attempt being made to invaginate the stump into the caecum, unless the gut at the root of the appendix is comparatively healthy. Generally, the appendix has perforated or sloughed off and must be dealt with as is best possible, and it may even be necessary to pack the peritoneal cavity all round and then put in a tube with a gauze wick on to the stump of the appendix and leave the abdomen widely open. Whatever is done to the appendix, and often it cannot be found at all or recognised as such, the pelvic cavity must be drained by a tube and, if necessary, the abdomen must be opened in the middle line just above the pubis to allow of this. Counter openings may also be made in the loins and tubes inserted into the kidney pouches so that when the original incision is partially closed there remain two tubes behind and one or two tubes in front, one reaching down to the stump of the appendix, the other into the pelvis. The after-treatment is essentially the Fowler's position, rectal saline injections, continuous or interrupted at four hourly intervals, early purgation by sulphate of magnesia, and all the various methods of general stimulation and prevention of shock. The tubes are dealt with as necessity requires, on the lines already indicated. Desperate as the patient's condition may be from the outset, a very considerable proportion of cases recover and may subsequently have the appendix removed if this has not been possible at the first operation. If distension persists, intestinal drainage by incising the distended gut, especially the caecum, and inserting a tube into it, may prove successful, the sinus usually healing up without further operation, though generally after a considerable time.

Symptoms directly due to the remains of the appendix are not common, most of the secondary effects, after this condition of general septic peritonitis and the operation it requires, being due to adhesions, not only around the appendix but sometimes in other parts of the formerly inflamed peritoneum.

Our general rule for the treatment of certain or doubtful appendicitis follows the dictum of the late Mr. Edmund Owen in such cases, "Look and see!" and we have never had any reason to regret this course. When a case is admitted that may be appendicitis we have for many years followed the plan originally proposed by G. Thom, a former Resident Surgical Officer, which is very much on the same lines as that described by Frank Kidd as his practice at the London Hospital. Kidd writes:— "If a suspected case of appendicitis is admitted, the patient is put at once into the Fowler's position, with no food, no drink, no purge, no enema, (We very often give an enema when the symptoms are not very acute)and no opium; and an hourly record is kept of the temperature, respiration and pulse, (Thom started taking them every half-hour which is still our practice and is to be preferred) and a careful note taken of the severity of the pain and the tenderness."

"Four hours later (preferably an hour later and certainly not longer than two hours after admission) examine again, and if everything has gone up and the local signs increased, operate at once: if not, it is better to leave it and do an interval operation (or operate when the acuteness of the condition has subsided). If the patient is seen within the first 12 hours operate at once." In fact, in all cases, it is best to insist that, where you are satisfied with the correctness of your diagnosis or have a suspicion it may be appendicitis, "look and see" at once.

Similarly, cases of chronic appendicitis must be operated on, as soon as the diagnosis is established; and, when a case is seen after a definite history of a certain or suspicious attack of appendicitis, operation should be undertaken without hesitation, if possible as an interval operation, when all signs of active inflammation are absent.

INTESTINAL OBSTRUCTION. Strangulated hernia accounts for by far the largest number of cases of intestinal obstruction, though most of the usual conditions leading to obstruction are occasionally met with. Gall stones are, however, very rarely seen in the intestine; acute intussusception is quite a curiosity, though chronic cases are met with from time to time, and also bands from the apex of a persistent Meckel's diverticulum. Umbilical hernia also accounts for a certain number of cases; and peritonitis, especially from appendicitis, also claims some victims. During 1913 there were, however, only 12 cases, apart from the 22 appendicectomies, that could possibly have caused intestinal obstruction; while there were 24 strangulated hernias and only one case of gall stones. Some of our cases of intestinal obstruction are secondary to a general septic peritonitis from some abdominal injury. *Prognosis* in all these cases of intestinal obstruction is bad, from the desperate condition of the patient on admission, and the operation is only too often quite hopeless from the beginning.

Most of the cases of PERITONITIS we have to deal with are traumatic in origin, with a small proportion secondary to appendicitis and other forms of intestinal obstruction, and must be treated with the general causal condition.

Certain other PERITONEAL AFFECTIONS are seen, especially ASCITES and TUBERCULOUS PERITONITIS. Apart from the commoner well-known *causes* of ascites there are in Egypt several local contributing causes. In 1913 there were 93 cases of cirrhosis of the liver with ascites, 44 of splenomegaly, 16 of endemic cirrhosis, 15 of malaria,and 3 of bilharzial cirrhosis. Eighty per cent of these ascites cases were associated with an enlarged spleen and frequently also with a cirrhotic liver in the advanced stages of Egyptian splenomegaly, which will be taken in detail later; while some few others are malarial in origin, and possibly also bilharzial cirrhosis contributes. Extreme cases are seen also with advanced cancer of the liver or uterus with general peritoneal dissemination.

Excluding cases of ascites from heart and kidney conditions, which have nothing essentially Egyptian about them, and which can only be treated by repeated tappings, other forms of ascites represent the last stage in a progressive cirrhotic condition of the liver, in which the establishment of a new collateral circulation is hardly possible, and any operation can be at best only a temporary palliative measure. We have tried the Talma-Morrison operation, with implantation of the omentum inside the sheath of the rectus or under the skin of the abdominal wall, combined with a small drain for several days in the middle line of the abdomen just above the pubis, but with disappointing results. Our best results have followed the draining of the ascitic fluid into the subcutaneous tissue by means of Paterson's glass bobbin. The skin is incised in the middle line and the bobbin is fixed in a slit at the outer edge of the sheath of the rectus, opening directly through into the peritoneum. The button thus provides a direct channel between the peritoneal cavity and the subcutaneous tissues to one side of the middle line of the abdomen. The skin incision is sutured and a large collection of ascitic fluid forms in the subcutaneous tissue and is slowly absorbed; and in some cases the ascites is very considerably diminished or even disappears and does not return. I have also tried to relieve the ascites by draining the fluid off through the crural canal into the upper part of the thigh; but the opening thus made very soon becomes blocked and the results are not at all satisfactory. Finally, lymphangioplasty, in various ways, by providing artificial silkthread routes from the peritoneal cavity to the subcutaneous tissues of the abdomen, or into the retro-peritoneal tissues of the iliac fossa,has been tried but failed to act for any length of time and no improvement could be recorded. On the whole we have come to the conclusion that repeated tappings are better than any more serious operative procedures and more likely to lead to some amelioration,if not a marked relief of the condition.

TUBERCULOUS PERITONITIS is not *generally* common and is most often of a miliary type with ascites, though the matting of intestines also occurs and the infection of the mesenteric glands. Several hopeless cases of tuberculous faecal umbilical fistulae have been noted, usually with extensive tuberculosis elsewhere.

Very rarely CHYLOUS ASCITES is discovered on tapping or open operation. Of itself it leads to no special complication but tends to reaccumulate.

Simple CYSTS OF THE OMENTUM, especially in children, occasionally occur; and sometimes extensive omental adhesions producing intestinal obstruction. These latter are nearly always secondary to an old appendicitis and the abdomen should not be closed until the appendix has been investigated and treated.

SURGICAL DISEASES OF THE LIVER. Excluding injuries, almost the whole of our surgical work on the liver in Egypt has to do with abscess, due in 90% of cases to secondary infection from a dysenteric intestine. Very rarely indeed it may be a suppurating hydatid cyst, an infective pyelo-phlebitis from septic thrombosis after suppurative appendicitis, or part of a general pyaemic infection.

LIVER ABSCESS is essentially a condition which is transferred to the surgeon for operation by his medical colleague, and it is hardly within our province to do more than describe the indications for operation, the operation itself, its after-treatment and complications; but my colleague Phillips has recently published such an excellent account of hepatitis and liver abscess as we find it here in Egypt, that I propose to give a resume of his observations and supplement them with my own experience of the subject. For fuller details reference must be made to his work entitled 'Amoebiasis and the dysenteries', published by H.K. Lewis in 1915.

The subject of liver abscess is particularly interesting to us here as much of the original work on the subject was done in Egypt; first by Kartulis, in 1891, when he successfully inoculated cats with dysentery from infected stools; and, later, by Ruffer and Willmore at Tor among the pilgrims journeying to and from Mecca. Liver abscess was reported by Larrey as prevalent among Napoleon's soldiers in Egypt in the beginning of the nineteenth century; and in 1887 Kartulis found the amoeba in a liver abscess in Alexandria.

Liver abscess is most common in the country south of Cairo and was formerly very frequent in Suez, but it has a fairly wide distribution throughout Egypt. Only seven cases were admitted to Kasr-el-Ainy during 1913 and 10 of hepatitis, though there were 96 cases of dysentery. Among better class patients this after-effect of dysentery appears to be more common, as in private practice the proportion of cases of abscess is considerably higher.

In nearly every case of hepatitis and liver abscess we can elicit a *history of dysentery*, usually of from two to six months ago or even more, and it may happen that the dysenteric diarrhoea is still present. I have noticed, too, that all the dysenteric symptoms have a habit of disappearing when the abscess is forming and tend to return a short time after its contents have been evacuated. In spite of emetine treatment, which has profoundly modified the course and progress of hepatitis and abscess, a fresh attack of dysentery is only too liable to come on after the treatment

of the abscess is altogether finished. It is now our custom to start with emetine in all cases of hepatitis, to push it when abscess is threatening or has definitely formed, and to continue it for fourteen days after the evacuation of the pus. A further course of a week may be given a month later, especially if there are any lingering signs of dysentery.

The nature of amoebic hepatitis and liver abscess. Amoebic infection from the intestine to the liver takes place by way of the portal vein; and possibly also by direct infection across the peritoneum from the colon-hepatic flexure — to the right lobe of the liver. Rogers has shown pathologically that amoebae are present in the clotted blood within the interlobular veins of the liver in a very early stage of liver abscess. Clinically, an *acute inflammation of the liver* is the first evidence of extension of amoebic disease to this organ. This is shown by an enlarged tender liver which macroscopically is in an hyperaemic softened condition and microscopically shows swollen degenerating liver cells with thrombosis in the interlobular veins, in the clot of which amoebae will be found. If the amoebae are in large numbers they may cause extensive thrombosis, and so shut off the blood supply of a considerable area. Into this necrosing tissue the amoebae migrate and lead to a further softening and the formation of a large single abscess.

If infection of the liver takes place from a very gangrenous dysenteric ulceration of the intestine, amoebae and septic micro-organisms reach the liver and multiple septic or mixed abscesses may form. B. coli also may play an important part in the formation of these abscesses, which are more dangerous than the pure amoebic variety on account of their greater tendency to general septic dissemination throughout the body.

Hepatitis generally develops rather slowly, within a variable time after the dysenteric symptoms have disappeared; or, in very acute cases, it may come on while the attack is still present. The patient complains of feeling seedy and has a sense of discomfort and heaviness in the region of the liver. This becomes more and more marked until he cannot lie on the right side. There is generally fever of rather an irregular type and sometimes rigors. The fever may persist for some weeks and is accompanied by profuse perspirations. There are the usual symptoms of a raised temperature and though jaundice does not usually occur, the skin is generally of a distinctly sallow colour. On palpation the liver will be found enlarged to a varying extent and very tender. The area of tenderness may sometimes be mapped out by hooking the fingers up under the margin of the ribs below, and so palpating the lower border of the liver and by poking with the fingers in the intercostal spaces in the axillary lines. This intercostal tenderness, often only elicited on quite firm pressure with the finger-tips, is a very constant and characteristic sign; and, as will be seen later, when an abscess is developing an intercostal oedema is equally suspect. Percussion may confirm the enlargement of the liver, both above and below; and an X-ray photograph will reveal the enlargement and also show an impairment of the respiratory movement of the right side of the diaphragm, and, generally at this stage, an absence of fluid in the pleural cavity. An examination of the blood will show a marked leucocytosis but with little increase in the number of the polymorphs.

The persistence of these signs and symptoms, with an irregular, often only nocturnal, fever, and an old or present history of dysentery, will always excite the gravest suspicion of hepatitis, or even abscess; and even at an early stage it may be advisable to confirm the diagnosis by exploratory puncture. If only hepatitis is present and pus has not definitely formed, dark blood only will be withdrawn in which may possibly be found amoebae and swollen degenerating liver cells. An abscess may be present and pus is withdrawn or it may be missed by the puncture and subsequently declare itself, or even clear up under the vigorous administration of emetine, which will be given in any case, both for the causal dysentery, if it is still present, and the hepatitis which was the original reason for the puncture. Many cases of hepatitis if seen sufficiently early and properly treated with emetine clear up entirely and do not recur. Others may undergo a temporary improvement but ultimately slowly progress to the formation of an abscess. Others again of a particularly acute type, or untreated, go rapidly on till an increasing thrombosis in the veins within the liver leads to an aseptic death of the area, thus deprived of its blood supply; and a softening and degeneration of all the liver cells in this area ends in liquefaction—hepatolysis—and the forming of a *typical amoebic liver abscess.* This most often occurs in the right lobe and is generally single, though they may be multiple and may occur also in the left lobe or, indeed, in any other part of the liver. The typical amoebic liver abscess has a very irregular cavity, often partially divided up by bands of trabeculae, with a very soft shaggy wall and without any definite fibrous capsule marking it off from the surrounding liver substance. It contains a thick brownish-red creamy fluid, rather like thin chocolate or anchovy sauce, when entirely free from organisms other than amoebae, and has a peculiar dank earthy smell. If there is any admixture with septic organisms, and especially with the bacillus coli, the colour changes to a greenish-brown and becomes very offensive. The contents of an amoebic abscess are not true pus but consist of liquefied liver tissue mixed with red-blood corpuscles; and microscopically are found degenerated liver and connective tissue cells, with leucocytes, amoebae, and small mases of necrosed liver tissue, but no bacteria.

Enlargement in size of the abscess takes place by an extension of thrombosis and the necrosis of small areas of adjoining liver tissue; or separate foci may form and coalesce, the portions of liver substance escaping the necrotic process forming the trabeculae in the cavity of the abscess. There is no sign of granulation tissue and no attempt to form a fibrous limiting membrane. Rarely, a very chronic abscess forms and has a definite limiting wall, partly from fibrous tissue but mainly from compressed and condensed liver tissue.

There is really no limit to the *size* liver abscesses may attain; in some cases they may almost completely fill the abdomen, a mere shell of liver substance supported by a thickened peritoneum alone remaining.

Microscopically, the essential changes leading to the formation of a liver abscess are thrombosis of the smaller vessels which contain amoebae; then liquefaction of the thrombosed area and escape of amoebae, which soon cause necrosis of liver cells and the formation of a granular debris, from the destruction and liquefaction of the cell protoplasm and the nuclei.

The amoebae are found in the wall of the abscess and are not generally present in the first discharged contents of the abscess, but only in the secretion passed from it two or three days after.

The *symptoms of liver abscess* may be perfectly obvious or in other cases be so indefinite as to occasion much difficulty in diagnosis. If their earlier history could be traced it would be found that they all go through the stages of acute hepatitis, though the majority of our fellaheen cases do not reach us until a very large abscess has formed. In general, the symptoms of hepatitis, instead of subsiding, persist and become aggravated. with a persistent and irregular temperature which often reaches its daily maximum in the late afternoon or during the night, and may assume a regular septic type. Rigors and sweatings are common and may occur without much fever ; indeed, in the absence of other signs, the fever is a very unreliable guide and I have seen cases of very large liver abscess without any or hardly any fever at all. From an early stage pain in the right shoulder, usually behind over the root of the acromion process, is a very marked and constant symptom and increases *pari passu* with the pain, heaviness,discomfort, and tenderness over the normal liver area below the costal margin, and laterally between the axillary lines. The liver is enlarged, often to a very considerable extent and not only downwards but upwards, its margin is soft, and it is tender over the inflamed area on palpation and percussion. There is often deep tenderness in the intercostal spaces between the axillary lines and also intercostal oedema in the same situation. You can distinctly feel the finger producing a pitting, not so much of the skin as of the deeper tissues between the ribs. This tenderness and oedema is a most important sign of liver abscess. The respiratory movements on the right side are distinctly impeded, there is often a catch with the normal breathing or on taking a deep breath, and a definite rub may be heard and felt until, later, a serous effusion occurs into the pleural cavity. The X—rays will show the irregular enlargement of the liver and the restricted movement of the diaphragm on the affected side,and may also show the accumulation of inflammatory serum in the pleural cavity.

As the abscess increases in size deep fluctuation becomes evident, the whole side becomes bulged and convex, until the intercostal spaces are quite obliterated; and standing at the bottom of the bed and comparing the two sides of the abdomen and chest a very marked difference will be seen. The whole of the right side from the fourth rib downwards forms a convex bulging extending down to the lowest limit of the abscess. Anteriorly, too, a rounded prominence indicating the limits of the swollen liver may be very marked, and large dilated veins are marbling the skin over the lower part of the chest and the abdomen. In many cases the patient is extremely thin and his swelling then appears to assume quite enormous proportions. In these advanced cases the abdominal wall is so thin that fluctuation is very easily obtained right through the swelling. Dyspnoea may be extreme, partly from pressure on the diaphragm and partly from effused serous fluid in the pleural cavity; and the abscess may threaten to burst through the abdominal wall or into the peritoneal cavity. The patient is very emaciated and weak and the various abdominal organs may be considerably displaced.

In such extreme cases *diagnosis* is quite obvious; but when a small abscess forms in the right lobe, and tends to enlarge upwards towards the diaphragm, the signs are not nearly so evident. The upper margin of the liver must always be carefully percussed out, especially posteriorly, and a careful stethoscopic examination made all round the attachment of the diaphragm, anteriorly laterally and posteriorly.

When the abscess occurs in the left lobe, a tender rounded swelling forms, with dulness continuous with that of the liver. The diagnosis can only be made absolute by exploratory laparotomy or, if the examination shows that the abscess has become adherent to the anterior abdominal wall, the diagnosis may be established by exploratory puncture. The general symptoms, though the right shoulder pain is missing, correspond to those of liver abscess in other situations; and fortunately the tendency is for adhesions to form, with oedema of the abdominal wall and a pointing of the abscess.

The patient with liver abscess often looks very ill and sallow but jaundice is not at all common. In an average case, the irregular temperature, the preliminary hepatitis, the enlarged painful and tender liver, the shoulder pain, the intercostal tenderness and oedema, and the actual physical signs of abscess, combine to make a very characteristic clinical picture, and the diagnosis is made absolute by the withdrawal of pus through an exploratory needle. This, however, as will be explained later, should never be done unless one is prepared to go on at once with the operation necessary for the evacuation of the pus.

The *blood changes* in liver abscess consist mainly in a marked leucocytosis, averaging in acute cases from 16000—32000 per c.m.m. and the presence of from 70—80% of immature polymorphs and a diminution, or even a disappearance, of the eosinophiles. When the blood picture does not improve and there still remains a large relative proportion of immature polymorphs after the abscess has been opened, it probably means that another abscess is present; but in cases doing well the immature cells diminish in number. In Egypt these differential blood counts may be profoundly modified by the presence of bilharzia or other parasitic disease, as well as by the original dysentery which has caused the abscess.

In obscure cases *skiagraphy* may afford valuable information, especially when the abscess is situated in the upper portion of the liver. A localised swelling may be seen pushing up the diaphragm above its proper level and there is a loss of mobility of the muscle on this side. Moreover the diaphragm may be seen so closely applied to the chest wall that adhesions may be assumed and so simplify a trans-pleural operation. Sometimes the abscess can be quite clearly localised by an alteration in the translucency of the affected part of the liver, which, with other confirmatory signs, may be of great value in diagnosis. As a proof of cure the X—rays may also be useful, especially when an abscess has burst through the diaphragm into the lung, when an opacity of the lower part of the lung and an indistinctness of the diaphragm may be shown.

To confirm the diagnosis of a liver abscess *exploratory puncture* is often necessary, but as with us this forms the preliminary part of our operation it will be referred to again.

The signs and symptoms of inflammation of the liver as above described are as a rule so definite that the *differential diagnosis* of the swollen liver has only to be made between hepatitis and actual abscess; but naturally all other causes of enlargement of the liver, and subdiaphagmatic abscess, must be first excluded. Sir Havelock Charles from an extensive experience in India considers it is necessary to exclude malaria, febrile congestions of the liver which are common in tropical countries, suppuration in the rectus muscle, right pleural effusion, tuberculosis with fatty liver, hydatid cyst, distended and inflamed gall bladder, gummata and new growth. Only a careful study of the case and its antecedents, and an examination of the various physical signs and symptoms of other possible conditions, will serve to make the diagnosis clear; but some cases, even after repeated aspirations, elude us and are only discovered after death.

Sir Havelock Charles, writing in the British Medical Journal of Oct. 24th 1908, sums up the symptoms and clinical appearances very well and from this paper I wish to add, to what we have already written, the following points:—

"The most frequent indications of liver abscess are fever and functional disturbances, a progressive enlargement of the liver, and pain. If, with these, there is fluctuation and oedema over the liver or in the intercostal space the diagnosis is absolute.

The patient will speak of fever, rigors, sweating, exposure to cold, dysentery or diarrhoea, indigestion worries, pain, cough, and perhaps insomnia; and may admit indulgence in alcohol. The fever is one of the most constant signs but is very variable. It may be continuous, remittent, intermittent, irregular, resemble malaria, or it may be low or even subnormal. The more chronic the case the greater probability of there being little or no fever. Rigors may have ushered in the trouble, single at the beginning, or several, or only a sense of chilliness. Sweating will be present, with or without rigors, and is generally profuse, especially at night when the patient falls asleep. The onset generally is acute with rigor, pain etc., but it may be gradual with malaise, languor, general debility, progressive anaemia, indefinite sign of congested liver, or acute hepatitis.

A hacking spasmodic cough may also be an important sign even before there are any signs of actual perforation of the diaphragm and implication of the lung.

On inspection the patient often looks very ill and is markedly wasted; the swelling will be remarked and also the deficient breathing on the right side. On examination with the X—rays, when there is subphrenic trouble and the pleura is unaffected, the dome of the diaphragm appears at once, the right half higher than the left; and the left side will continue to move with respiration and the costophrenic space is free especially during inspiration. On the right side, on the contrary, the diaphragm is almost motionless and the costophrenic space will be pressed on in parts. If the pleura be filled with fluid the outline of the vault will be indistinct and the upper level of the liquid will show a horizontal line slightly concave.

The urine may show increased ammonia and diminished urea and the blood must always be carefully examined.

With the patient sitting and lying down, practise palpation, percussion and auscultation. Palpation will demonstrate imperfect movement in the chest and abdomen. The pain can be localised by following with the finger the edge of the costal arch from before backwards, pressing upon any irregular or hard mass that may be below it, and then following the intercostal spaces from below up. This deep methodical pressure will, as a rule, reveal in the midst of the general tenderness a zone of maximum sensibility. Percussion may show dulness in front to a variable extent to the fourth or even the third rib, in the mid-axillary line possibly to the fifth rib, and behind the dull area may extend to the angle of the scapula. Both sides must always be compared. Auscultation signs will depend on the extent of the interference of the abscess with the right base and and there may be crepitations and friction. There may be no respiratory murmur and no thoracic vibration and immediately above this area, and often without transition, pulmonary resonance and respiratory sounds return. Along the upper edge of a large area of dulness the lung acts quite well; and during deep inspirations the respiratory sounds are heard very low down below the level of the dulness. Even if there are pleuritic signs and bronchial breathing they cease suddenly at this level. Before an abscess gets through the diaphragm, it is preceded by a serous effusion in the pleural cavity with the usual signs.

The last and final method of diagnosis is that of aspiration," which will be fully dealt with later.

The treatment of hepatitis and liver abscess. The first thing to be done when hepatitis is suspected is to make careful enquiry and examination for evidence of past or present dysentery and to treat any symptoms that may still persist. Apart from the appropriate local measures, this will consist largely in the administration of *emetine*, which forms also the basis of treatment for the hepatitis. An ampoule containing ½ grain of emetine is given hypodermically twice a day and steadily continued for at least ten days. By this time if the inflammation is going to clear up it will have shown quite definite signs of doing so. On the other hand, if an abscess is forming, the local and general symptoms will become progressively more definite. In the absence of active dysentery, saline aperients are given as necessary; and Phillips advises a mixture containing sodium sulphate 2.0; sodium bicarbonate 1.0; and sodium salicylate 0.65; three or four times a day, and a mildly alkaline water, such as Vichy (Celestins). Cholelith pills are also of benefit, two pills four times a day. The diet is kept low and suited to fever and a congested liver, and alcohol must be avoided. *Locally*, repeated hot fomentations must be applied, or poultices or other form of hot application, or antiphlogistine. The pain may be so severe that sedatives, even morphia, may be necessary. If emetine is not procurable, ipecacuanha powder, made into a large pill, with tannic acid, must be given by mixing 2.0 of the ipecacuanha with 0.65 of tannic acid. This is divided and put into four cachets, which are taken all at one time once a day. Chloride of ammonia is a third alternative; but, when available, the modern treatment of hepatitis means emetine and emetine only.

If abscess appears to be forming, or, as more often happens in hospital practice, it has existed for some time, preparations must be made for *operation.* In most cases a general anaesthetic is advisable and this must be a minimum of chloroform followed by open ether, after a preliminary injection of morphia and atropine. The operation must be done quickly and as little anaesthetic of any kind given as possible. In very bad cases local anaesthesia, with a 1 % solution of cocaine, may be sufficient, a few drops of chloroform being given as the rib is cut through. With the patient lying on the left side and just sufficiently under the anaesthetic not to move, an *exploring needle is introduced* into the intercostal space, as near the posterior axillary line as possible, over the suspected area. It is not possible to define the exact space and several punctures may be required over a considerable area before pus is found. No harm is done provided the needle is introduced at right angles to the chest wall in each situation and the needle itself is not introduced more than 3¾ inches (9 cm.). A needle of good calibre should be used, or thick pus will not run in it, and care taken before its introduction that the syringe to which it is attached is working properly. The needle should be pushed onwards in stages, an attempt at aspiration being made at each stop, as not infrequently a central abscess has a considerable thickness of liver substance all round it and can be easily missed.

So important do we consider the finding of pus with a needle that we never go on with the operation unless pus is forthcoming. We either put off the operation altogether or postpone it until the symptoms have become more pronounced and then try again. I have never seen any untoward happenings from exploratory puncture of the liver; but, naturally, the operation, for operation it is, must be done with all aseptic precautions and with due attention to anatomical knowledge and surgical principles. Moreover, if one has any doubt, either of the leakage of pus into the peritoneal cavity or of haemorrhage as a result of the puncture, the necessary operation can be done at once. This is the main reason why the aspiration should be undertaken as the preliminary stage of the operation and never casually or carelessly as a simple means of diagnosis.

Having found pus, the needle is left in situ, the syringe removed, and the opening of the needle plugged with a small piece of sterilized wool or gauze. The *rib above the needle is then excised* for a length of three or four inches and the pleura incised. This generally means that the pleural cavity is opened and the needle will be seen piercing the diaphragm to enter the abscess cavity. Any fluid that may be in the pleural cavity escapes and an incision is then made through the diaphragmatic pleura and through nearly the whole thickness of the diaphragm muscle, equal in length to the incision in the parietal pleura, and over the most prominent portion of the diaphragm, on either side of the needle. With a medium catgut suture on a curved round-bodied needle, the cut edges of parietal and diaphragmatic pleura are stitched to each other all the way round, thus shutting off the pleural cavity and making the further stages of the operation entirely extra-pleural. Care must be taken to accurately close the pleura at each end behind the cut rib; and, if necessary, a further piece of bone may be removed at either extremity of the wound to accomplish this. If it is not possible, owing to the distance

of the dome of the diaphragm from the parietal pleura, to shut off the pleural cavity in this way, a plug of gauze must be placed in the gap all round and left in to allow adhesions to form and prevent the leaking of pus into the pleural cavity. By turning the patient on to his back and thus allowing the heavy liver to fall back against the diaphragm, the suturing of the two layers of pleura is much simplified (Day).

The diaphragm within the denuded area is now cut through, the needle removed, and the knife pushed straight on into the abscess. The finger follows it up at once and hooks up the liver against the diaphragm, if there are no adhesions, and holds it there while several anchoring sutures of strong catgut or silk-worm gut are inserted, passing from the interior of the abscess cavity through the liver, diaphragm, and chest wall, and tied externally. In this way no leakage occurs, either at the time of operation or later, from the slipping back of the liver with its opened abscess. Very often the liver is already firmly adherent to the diaphragm and no anchoring sutures are necessary.

The finger also plugs the opening and allows the pus to drain away slowly. The anaesthetic is at once stopped and the patient turned carefully on to the right side and the pus poured from him. The limits of the abscess are explored with the finger and two large tubes placed in the most dependent positions, reaching almost to the depths of the cavity and not fixed to the skin, but pierced with large safety pins to prevent them falling into the abscess. No further examination or washing out is done, the skin incision is reduced in size by catgut and silk-worm gut sutures, the deeper parts of the wound packed with gauze, gauze wrapped round the pins and tubes, and a larger dressing fixed over all. The patient is put in a modified Fowler's position and inclined towards the right side and the outer dressing frequently changed.

Very soon the tubes tend to push out as the cavity collapses, when they must be shortened to prevent the possibility of their penetrating the liver substance beyond the abscess cavity and even opening into the peritoneum. This is liable to occur if the tubes are sutured to the skin at the time of the original operation.

In most cases no irrigation of the abscess cavity is necessary, the wound is dressed as cleanly as possible, the tubes gradually shortened, and finally a plug soaked in eusol ultimately leads to the complete closure of the resulting sinus. If the dressing becomes septic, or drainage is unsatisfactory, large gentle irrigations of cyllin, 1-500, or eusol, or diluted oxygen water, may be of great value, and the tube must not be removed until the discharge has become quite serous and insignificant in amount. These cases require most careful attention after the operation and until they are absolutely cured. From the day after the operation emetine is given, one grain a day, and continued for ten days. It is then stopped for a few days and renewed for a further week or longer, if the discharge does not clear up satisfactorily.

In some cases we find that after excising the rib we can reach the abscess without opening the pleural cavity at all. This may be due to extensive adhesions all round or to the opening being made below the diaphragm. The operation is thereby much simplified; but, if no

adhesions are present, special care must be taken to hook up the liver to the abdominal wall and fix it with anchoring sutures before allowing the complete evacuation of the abscess. It is hardly practicable to pack off the non-adherent liver from the peritoneal cavity and, moreover, it is not necessary if the procedure just mentioned is adopted. I have never seen any peritonitis or other trouble arising from the leakage of a small quantity of liver abscess pus into the peritoneum.

It sometimes happens that the abscess has become sub-diaphragmatic, in which case, if we are fortunate enough to excise the right rib, the drainage is quiet easy; though the tubes must not be removed too soon or a pocket will be left in the upper part of the liver, in which pus may re-accumulate and even lead subsequently to a perforation of the diaphragm and rupture into the pleural cavity or bronchus. These sub-diaphragmatic collections, either primary or residual, may open into the pleural cavity by detaching the costal attachments of the diaphragm and perforating the diaphragmatic pleura. A large empyema is thus formed, the pus in which has much less smell than usual and often contains quite a considerable amount of bile. In most of these cases it is sufficient to drain the pleura by a long tube passing vertically upwards from the wound, in addition to the tube or tubes which are placed transversely to drain the main cavity of the abscess. The patient should be put in the Fowler's position and inclined towards the right side. If the pleural drainage is inadequate a further excision of rib more posteriorly and the introduction of a tube may be required.

These trans-pleural or sub-diaphragmatic operations, are by far the most usual procedures for the evacuation of a liver abscess; and though it may be so large as to present an enormous tumour in the abdomen, an attempt must always be made to effect drainage by this route, even though a fair thickness of liver substance has to be incised to reach the abscess.

When, however, a localised abscess occurs towards the left margin of the right lobe, or in the left lobe, an *anterior* operation must be practised. This consists in an abdominal section in the middle line, or in one or other linea semilunares, with very careful deepening of the incision at every stage, so as to profit by adhesions that may have formed or are forming. If no adhesions are present, the abscess must be brought under the incision and a good packing of gauze placed all round between the peritoneum and the liver to shut off the main peritoneal cavity. The abscess is then incised and the pus evacuated, the patient being turned on the right side to complete the emptying of the pus. A series of strong catgut or silk-worm gut sutures are then inserted all round to fix the cavity of the abscess to the parietal peritoneum, the plug being removed bit by bit as the sutures are inserted. The abscess is thus "marsupialised" and tubes inserted for drainage as required, and the ends of the incision closed to some extent by silkworm gut sutures. Satisfactory drainage is not always easy to effect and after the first day or two the patient may be turned on to the face, supported by pillows, for an hour at a time. Most cases heal up wonderfully quickly, the steady administration of emetine forming a very essential part of the after-treatment.

We have but little experience of the treatment of liver abscess by *aspiration with trocar and cannula,* as our cases rarely present themselves for treatment until the abscess has assumed considerable proportions, but it is a valuable means of dealing with smaller abscesses. With all the usual precautions common to the other operations, a large trocar and cannula is introduced through the appropriate inter-costal space and the flexible cannula, or a special drainage tube passed through the cannula, left in. Personally, I always prefer an open operation which, with proper surgical care in the after-treatment, usually does very well. Similarly simple *aspiration,* which may be repeated several times, is also advised, but is only likely to be successful when the collection is quite small and emetine is pushed.

The general *after-treatment of operations for liver abscess* must be carried out with the most scrupulous aseptic care to prevent septic infection of the ragged and inviting abscess cavity. The dressings must be frequently changed, the position of the patient varied to suit each particular case, the tubes progressively shortened as the cavity becomes more contracted. The tubes are then removed and only a light packing is required and the sinus eventually heals up. All the time the patient's general condition must be attended to, emetine given in grain doses for several days, and a careful watch kept on the motions for any evidence of returning dysentery, which must be promptly and energetically treated.

Prognosis in liver abscess is relatively bad, both on account of the liver condition and its local and general complications, and the causal dysentery and the possibility of its recurrence. Statistics are decidedly misleading, as each case differs so considerably from another, but a favourable estimate, perhaps erring on the good side, gives a mortality of 35—45 % in Egypt.

The introduction of emetine has completely altered the general prognosis of liver abscess and has very largely prevented its occurrence, by killing the causal amoebae in the intestine or in the hepatitis which is the forerunner of abscess. But, while many of the dangers of this disease can now be effectively dealt with, there are still several factors which influence the prognosis of liver abscess both before and after the operation.

Thus, the patient may be, and often is, in such a *weak condition* when he presents himself for treatment, that he never recovers from the shock of the operation. Indeed, in all cases, careful precautions must be taken to counteract the profound exhaustion which has resulted from the long-continued amoebic suppuration and destruction of the liver.

Then again it may be found that the abscess is due to *septic infection* from a bacillary dysentery or from an amoebic dysentery become septic. In this case multiple pyaemic foci may occur and the prognosis is very bad indeed. The liver is painful and tender but not much enlarged, and on opening the abdomen it is found to be studded with innumerable minute abscesses scattered over the surface beneath the capsule and throughout its substance. The organ is darker in colour than normal, soft and doughy,

and pits on pressure. It feels exactly like a decomposing liver as felt in the post-mortem room. These septic abscesses, single or multiple, may come on after dysentery, and also from a septic thrombosis secondary to a suppurative appendicitis or other inflammatory abdominal condition.

A not uncommon cause of failure to cure is the presence of *other abscesses* in the liver, either missed and left unopened at the operation, or beyond the reach of operative interference. As already pointed out the examination of the blood may give important evidence in this respect. In one case I had evacuated a very large abscess in the right lobe but at the time noticed that the left lobe was also considerably enlarged. The patient's condition did not allow of further operation, but next day I opened the abdomen in the middle line, made an incision deeply into the left lobe and explored it in all directions, but failed to find any abscess. On post-mortem examination some days later four other abscesses were found in the liver; two on the upper surface high up in the vault of the diaphragm, another on the under surface of the left lobe, and a smaller one in front towards the left margin of the lobe. All these had been carefully avoided by my incision and explorations. In another case I had opened a large abscess in the right lobe only to lose the patient from septic absorption and a recurrence of dysentery. An abscess was found just to the left of the neck of the gall-bladder and another, which would have been quite impossible to reach, in the substance of the liver pointing towards the posterior surface of the right lobe.

Then again *septic absorption* may come on and gradually get worse from the accumulation of thick pus, which has become infected, within the abscess cavity. This occurs when the tube is removed too soon and can be avoided by proper dressing in every way. A similar *chronic pyaemic condition* may result from inadequate drainage from the time of the operation. In the course of the operation, also, infection of the pleura may occur, or even peritonitis, from leakage of pus, and all the dangers attendant on the conditions thus excited are super-added to the original risks.

A *return of dysentery* is always to be feared. The abscess in the liver appears to act almost like a safety-valve for the dysentery, the symptoms of which often stop during the development of the abscess only to return with renewed vigour some days or weeks after the abscess has been opened. The prognosis in such cases will entirely depend on the efficacy of treatment of the dysenteric condition and has become increasingly better since the introduction of emetine.

The prognosis is intimately dependent upon the question of *complications of liver abscess* which must now be described in some detail.

Local complications within the liver. Sepsis is by far the most common complication and may be primary or secondary. Primary sepsis shows itself in the liver as multiple pyaemic abscesses, produced by a mixed infection of amoebae and staphylococci. This condition has already been noted. Sometimes, also, a large septic abscess may form with or without multiple minute foci elsewhere in the liver. These septic abscesses occur as a result of infection from gangrenous sloughing of the intestine in

amoebic dysentery and the prognosis is bad from the beginning, both from the dysenteric condition and the secondary infection of the liver it gives rise to. When it is possible to deal with such abscesses at all, they must be treated by drainage as in an amoebic abscess.

It is quite possible also that *bacillary* dysentery of various types may lead to abscess of the liver; either single or multiple, which run the same course as those resulting from a secondarily infected amoebic dysentery.

Infection of a liver abscess sometimes occurs also, either primarily, or secondarily after the operation, from *bacillus coli*, leading to an extraordinary massive gangrene of the liver with a pronounced decomposing and faecal odour which may be quite overpowering. The cases I have seen of this nature were in the pre-emetine days and can only be treated by free opening, constant irrigation with eusol, oxygen water, or other antiseptic, and large quantities of emetine.

Rarely *haemorrhage* may occur from an abscess cavity, both before operation and after. Such cases must be plugged with gauze if possible and injections of gelatine freely given. A sterilized 10 % solution must be used and from 20-50 cc. injected at a time and calcium chloride and lactate freely administered. A similar treatment is necessary when intestinal haemorrhage occurs after evacuation of a liver abscess.

Secondary sepsis is only too frequently introduced during the after treatment of an operation for liver abscess and chronic septic infection is very liable to occur. Once sepsis has been thoroughly introduced there is no saying where it will stop; whether it will lead simply to a sepsis involving the abscess cavity only, or to an extension or fresh sowing of absceses around the original abscess, or end in a generalised septicaemia or pyaemia. All these various conditions must be appropriately dealt with should they arise.

It is generally considered that alcoholic patients are particularly liable to the formation of large abscesses, which very readily undergo a necrotic extension.

The further complications of liver abscess result from its direct extension into neighbouring organs or cavities, or to secondary deposits of amoebae from the diseased liver.

The most important and troublesome of these is *abscess of the lung*, which usually arises from the direct upward extension of a liver abscess. The abscess pushes its way up to the diaphragm and slowly perforates this muscle. While it is doing so the lung becomes adherent to the inflamed diaphragm and the abscess ultimately bursts into an inflamed consolidated lung and thus to the larger bronchi, whence the pus is expelled by coughing. More rarely the abscess of liver may have opened into the pleural cavity and thence into the lung; or rarer still, an abscess in the lung may occur as a result of an embolic infection direct from the intestine, or from the liver, along the ligamentum latum pulmonis or by way of the mediastinum.

However it originates the abscess is irregular in shape, and prolongations of the cavity may extend into the lung tissue, or masses of necrotic tissue may project into the cavity, just as in a similar abscess in

the liver. The lung around is usually consolidated, and oedematous fluid can be squeezed out on pressure. Occasionally there is no definite abscess cavity, the lung at the site of the lesion appearing as a boggy infiltrated mass of tissue. In chronic cases there may be an attempt at a lining membrane and the cavity may be seen to open directly into a bronchus. The sputum may have the characteristic chocolate colour and microscopically will contain liver cells and red-blood corpuscles.

The early *symptoms* of abscess of the lung are rather indefinite, with pain over the lower part of the chest on the right side and often severe pain in the right shoulder, with a dry cough. Some dulness and evidence of consolidation may be found at the right base, and breathing is more rapid than normal and often with a catch in the side. The liver may be found enlarged and tender also; in fact, we may find all the symptoms of hepatitis, if the possibility of this condition is realised. In a day or two there is some mucous expectoration which soon becomes blood-tinged and ultimately typically chocolate-coloured. A considerable amount of pus may be coughed up with much relief to the temperature and the symptoms generally, which return as the abscess re-fills. Sometimes the pus may go on being expectorated almost indefinitely until some operative measures to drain the abscess cavity are adopted. The *diagnosis* of these cases is sometimes very difficult and the microscopical examination of the sputum must always be made in confirmation.

Most of these cases now clear up fairly quickly under emetine and postural treatment. McKechnie reports a good case of the kind in which the patient was made to hang suspended over the edge of a table, head downwards. In this position he was made to cough and squeeze his chest, five or six times a day, till no more pus came out. At first large quantities of pus were coughed up but the quantity rapidly diminished and in about six weeks he was cured.

Failing such a result a most careful search must be made for the abscess cavity in the liver, which should be drained, and dressed subsequently under strictest aseptic conditions. It is often very difficult to find such abscesses, and equally difficult to properly drain them, and extensive removal of ribs may be necessary. Once the abscess in the liver is properly drained the lung condition rapidly clears up under emetine. An X-ray examination may give valuable assistance; and the searching for the abscess should be done when symptoms go to show that it is full of pus.

On rare occasions an abscess of liver may *burst through the skin* and discharge its contents, in which cases the cavity usually becomes very septic and is so found. The abscess may also open into the *stomach* or *intestine* or even into the *pericardium*. Fortunately, it does not often open into the *peritoneal cavity*, but when it does so, the resulting condition is almost always fatal.

Among the other possibilities of a generalised amoebic infection may be mentioned cerebral abscess, parotitis, abscess of the spleen, cystitis, salpingitis, and also arthritis, especially in the knees, and I have seen one case in the sterno-clavicular articulation.

HYDATID CYSTS very occasionally occur in the liver in Egypt and it is significant that our last two patients with this disease came from Armant, a village in Upper Egypt, famous for the quality and quantity of its dogs. Considering the intimate family and domestic relations that exist between the average fellaheen and his animals, this rarity of hydatid disease is at first sight rather surprising; but, as Looss has pointed out, the dogs are but seldom the hosts of hydatid disease. Hydatid of the liver in man has no special Egyptian features and is treated by open operation and marsupialisation, whether it be still uninfected or has become a large abscess.

Among other enlargements of the liver we sometimes come across a condition of acute CARCINOMATOSIS, with which is associated an haemorrhagic peritoneal effusion and which gives rise to a very marked leucocytosis, often to as much as 22000. In a recent case, which simulated liver abscess, but in which exploratory puncture proved negative, an abdominal section disclosed the true nature of the case and a considerable quantity of blood-stained fluid in the peritoneum. The fatal issue was only a matter of days and at the autopsy the liver was found to be simply one mass of soft cancer, probably originating in the liver, as no other primary focus could be discovered.

SYPHILITIC GUMMATA are rare; but the various forms of CIRRHOSIS which, in the main, have a medical interest, must be remembered. Surgically, the varieties due to bilharzia, and those occurring as part of the condition to be described as Egyptian splenomegaly and producing ascites, are among those that possess a surgical interest. Alcoholic cirrhosis hardly exists in Egypt among the fellaheen and the so-called tropical liver is equally uncommon.

The GALL-BLADDER so rarely comes under our surgical notice that its diseases must be studied in the ordinary text-books; but among the better-class Egyptian there is a certain small amount of gall-bladder surgery. As in operation on the liver special care must be taken with the anaesthetic; as delayed chloroform poisoning, with acidosis and cholaemia, is very liable to occur from an unnecessarily large dose of chloroform and invariably with a fatal result.

Similarly the PANCREAS very seldom obtrudes itself on our notice, except occasionally in the form of large single cysts with typical pancreatic characters. It is also seen involved in a general cancerous infiltration originating in the pylorus or liver.

SURGERY OF THE SPLEEN. Just as in the liver, abscess predominates to the exclusion of almost everything else, so with the spleen, splenectomy for the early stages of Egyptian splenomegaly, forms the essential part of the surgery of this organ; apart from its removal for rupture, to which reference has been made with injuries to the abdomen.

EGYPTIAN SPLENOMEGALY. Our scientific knowledge of this condition in Kasr-el-Ainy is of recent date and goes back only as far as the publication by my colleagues, Ferguson and Day, an account 'of a form of splenomegaly

with hepatic cirrhosis endemic in Egypt,' in the Annals of Tropical Medicine and Parasitology, Vol. III., No. 3, November 1909. Here are their observations:—"Hepatic *cirrhosis* is a very common disease among the native Egyptian and is responsible for most of the cases of ascites admitted to hospital. Over 4 % of the total medical admissions to Kasr-el-Ainy are ascites: another 16 % had signs of early hepatic cirrhosis, and another 7 % had chronic splenic enlargement, which, in most cases, represents the earliest stage of this syndrome i.e. *splenic enlargement, hepatic cirrhosis, ascites.* An enlargement of the spleen and liver is frequently seen before the onset of ascites and all stages in the subsequent cirrhosis of the liver are met with. This group of symptoms is very commonly associated with advanced bilharziosis, anchylostomiasis and pellagra, but these conditions are not of themselves causes of ascites. This splenic enlargement is probably much more common that is generally supposed; and in 300 cases admitted to the surgical and eye wards, and presumably therefore not complaining of any medical condition, eight per cent had splenic enlargement, over three per cent had enlargement of liver and spleen, and more than two per cent had definite cirrhosis with enlarged spleen. Further, Dr. E. H. Ross examined over 7000 children under 16 years of age and found 6.8 per cent with enlarged spleen.

The disease is most common after twenty-five years, though it is sometimes seen at quite an early age; and the onset of ascites is generally postponed for five or more years. It is more common in males than females, though it must be remembered that a much smaller number of young female adults are admitted to hospital than males.

The *symptoms* in the earlier stages are very indefinite, there is only a slow painless *enlargement of the spleen* with some degree of anaemia. As the disease progresses the abdominal enlargement and discomfort become more pronounced; and an irregular fever may be present and a long-continued diarrhoea or dysentery.

The second stage of the disease is indicated by definite *hepatic enlargement*, an *increased enlargement of the spleen*, and certain *blood changes.* There is very definite wasting, with a moderate degree of anaemia, and the great majority of cases show slight fever of an irregular type. Occasionally there may be high fever for some weeks due to an exacerbation of the disease and not to any complication. The temperature may show a double remission in twenty four hours. Locally, a dragging pain in the left side, due to the enlarged spleen, is common. Discomfort after meals and tenderness over the hypochondrium is generally present at some stage and is caused by the commencing perisplenitis and perihepatitis. In advanced cirrhosis congestion of the stomach and fixation by adhesions may set up a chronic dyspepsia, which the patient seeks to relieve by inducing vomiting after a heavy meal. Haematemesis is not common but may be the first symptom of the disease and be accompanied by other signs of portal congestion. These complaints are often illustrated by the scars of cauteries and setons (كي وخزام) with which the patient has tried to relieve his pain.

On examination the abdomen has a very characteristic shape which is well seen in the photographs. There is an outward expansion of the lower ribs, a widening out of the costal angle, and a general enlargement

of the upper part of the abdomen, often with separation of the recti muscles, the result of the pressure exerted by the enlargement of the liver and spleen, which may indeed be visible swellings. The condition of the viscera varies within considerable limits, and is influenced by the duration and severity of the disease and possibly also by the age of the patient. The *liver* is felt uniformly enlarged, smooth at first, and of a firmer consistence than normal. Later this enlargement is attended with fibrotic contraction which gives it an irregular granular surface. With increasing cirrhosis the organ shrinks, but is rarely reduced to less than its normal weight. When the spleen is much enlarged the hepatic changes are obscured, since this organ is displaced upwards and to the right.

The *spleen* attains its greatest dimensions when the disease is advancing rapidly, more especially in young subjects below the age of 20. In some cases it may reach some distance beyond the umbilicus; and the diaphragm, with the thoracic viscera, is displaced upwards. It may overlap the liver if the latter be also much enlarged. With the gradual development of hepatic cirrhosis the spleen becomes much harder and may shrink somewhat. Thus the state of the liver can generally be inferred from the consistence of the spleen; for if the latter is hard, even if only projecting a finger breadth below the costal margin, hepatic changes are certain to be advanced. Adhesions may prevent the descent of the spleen and in some cases, where the liver has been markedly cirrhosed, the former organ could not be felt on abdominal examination.

The duration of this stage may apparently be indefinite. The longest interval noticed before the appearance of the ascites was fifteen years. Many mild cases may show no further symptoms; and the progress of the disease be arrested, or the patient be carried off by some intercurrent disease.

The disease, however, attracts most notice when the hepatic cirrhosis is followed by *ascites* with its attendant miseries. This serious event may be due to the gradual obliteration of hepatic vessels; but, in many cases, the history suggests that a fresh infection, acting on an already cirrhotic organ, may be responsible. Evidences of portal congestion, such as nausea, vomiting, haematemesis, melaena, and haemorrhage, from the bowel or from piles, may precede its onset. Rapid emaciation follows. At this stage the patient presents the familiar picture of cirrhotic ascites. The pinched features and wasted hands offer a striking contrast to the greatly swollen abdomen. The effect of the high intra-abdominal pressure is seen in the protuberant umbilicus and network of dilated superficial veins, which return blood from the oedematous legs into anastomoses with the thoracic vessels. Jaundice is rare except as a terminal event.

Upon palpation the cirrhosed liver can usually be felt in the epigastric angle and the enlarged spleen recognised by 'dipping'. Most cases of ascites require tapping on admission, and this has to be repeated on an average every ten days, about eight litres being withdrawn on each occasion. After removal of the fluid the organs can be better investigated, when the liver is more often found enlarged than contracted and the spleen hard and of considerable size. The heart is displaced upwards, the

urine may show traces of albumen, and congestion of the bases of the lung with bronchitis usually follows. These latter signs may be an indication of heart failure and be complicated by the development of hydrothorax.

The duration of this stage is considerably shorter and may be reckoned in months instead of years ; the consequent prognosis is the same as in alcoholic cirrhosis with ascites. The records of fatal cases show that death occurred on an average four months after the appearance of ascites, the longest interval was four years. Occasionally one meets cases where the patient has been temporarily or permanently cured. Thus two patients were tapped and remained free from ascites for three and a half and twelve years respectively."

Reference has already been made to the possible operations for ascites of this nature, and I have deliberately quoted this excellent description of the third stage of this disease in full, as it shows how clearly contra-indicated is any such radical procedure as splenectomy.

"The immediate cause of death was commonly hepatic insufficiency, the patients gradually passing into a comatose state, occasionally with jaundice. Lung complications and heart failure from exhaustion account for most of the remainder."

Pathology of Egyptian splenomegaly. Ferguson first points out that the disease presents many points of resemblance to Kala-azar ; "but we have never found in material taken from spleen or liver any parasites with the characters of the Leishman-Donovan body."

"The *blood* has been examined by us in upwards of forty cases. The majority of these were admitted for the relief of ascites, cirrhotic change in the liver with splenic enlargement being already well established. The degree of anaemia is sometimes extreme, only 1,330,000 red corpuscles per cubic mm. being recorded in one of our cases. The average number of *red corpuscles* per cubic mm. in the forty cases examined was 2,635,440. The red blood corpuscles exhibit very considerable variations in size in the more advanced stages of the disease, although the discoid form is usually preserved. Polychromatophilia is frequently observed, chiefly affecting the larger corpuscles, but the occurrence of nucleated red corpuscles is a very rare phenomenon.

With regard to the white cells a definite *leucopaenia* has always been found during what may be called the hospital phase of the disease. Thus the average leucocyte count in the series of cases examined was 4,503 per cubic mm. and the percentage proportion of the main varieties of leucocytes present, calculated from a series of differential analyses, gives the following figures :—

Polymorphonuclear neutrophiles,	62.84
Lymphocytes, - - - -	25.26
Large lymphocytes and hyaline cells, - - - - - -	5.50
Eosinophiles, - - - - -	6.40

PLATE 51.



Fig. 1.- Splenomegaly with slight ascites. Splenectomy. Wt. 2275.0. Patient died shortly after operation from slipping of ligature splenic vein during an attackon of vomiting.



Fig. 2.—Splenomegaly showing particularly the widening of the costal angle and the much enlarged liver. Ascites.



Fig. 3.—The last stage of the pisease with marked ascites, herniae, and general oedema of scrotum and legs.



Fig. 4.—Side view of the same patient.

Thus the polymorphonuclear cells are relatively diminished, while the proportion of the other classes, and particularly of the large hyaline cells and eosinophiles, is distinctly increased. A certain degree of eosinophilia is of such frequent occurrence in Egypt, as the result of bilharzia and anchylostoma, that this feature of the blood formula may be at once discounted.

The *bone marrow* has always been found more or less profoundly affected. That of the ribs is almost always diffluent, its colour varying with the degree of anaemia. The femur always manifests an active transformation of its marrow; in some cases this is of a reddish gelatinous character and in others it is of deep red colour and firm consistence, resembling in appearance that of pernicious anaemia. In both situations the hyaline non-granular elements of the marrow are very notably increased, the majority of the cells being of the dimensions of a large lymphocyte with pale staining nucleus of simple spherical form. The relative reduction of the granular cells of the marrow, particularly of the neutrophile variety, is sometimes a marked feature and this is most noticeable in marrow taken from the ribs. The marrow is also frequently the seat of congestion and haĕmorrhage. Nucleated red corpuscles are by no means abundant; and evidences of nuclear activity in any of the types of marrow cells are very rarely met with.

The *spleen pulp*, either withdrawn before or examined shortly after death, contains no parasites. The material withdrawn from the spleen during life consists almost entirely of red corpuscles with a considerable number of lymphocytes. Very few of the large mononuclear phagocytes of the spleen are found in the contents of a syringe introduced into the enlarged and indurated organ of this condition. In films made post-mortem, however, these cells occur in considerable numbers."

The condition of the liver. In nearly ten per cent of autopsies Ferguson found evidences of cirrhosis of the liver, not due to alcohol, tertiary syphilis, or bilharzia, all of which are probably instances of the disease we are considering.

"Half of these cases died as a direct result of the secondary changes induced by cirrhosis; and in the remainder it was discovered incidentally; about one-third of these cases were associated with some enlargement of the liver, in the remaining two-thirds the organ was either normal or slightly reduced in size. The general type of cirrhosis was a fine diffuse variety without producing much, if any, external alteration of the organ. There was also some general enlargement of the liver as well as a moderate enlargement of the spleen. Microscopically, there is a certain amount of cellular fibrillated tissue, mixed with lymphocytes, surrounding groups of lobules and the liver cells are large swollen and highly granular. Their nuclei are paler than usual and each contained several nuclei. Here and there minute isolated foci of necrotic appearance surrounded by collections of small mononuclear cells were met with, but no parasites were found in the liver.

In cases where death was directly due to a long established cirrhosis the liver is generally reduced in size though never extremely so. In the majority of cases, old adhesions, due to perihepatitis, exist between the convexity of the liver and the diaphragm, such adhesions being

sometimes complete and universal. The liver is in a state of multilobular cirrhosis, the nodular projections on the surface being always small firm and closely set. In section the colour is yellow or yellowish brown; and, examined microscopically, persistent islands of hepatic tissue of irregular size are separated from one another by extensive bands of connective tissue of somewhat varying character. The tracts of hepatic tissue contain large universally granular liver cells which have lost the more or less regular ramifying arrangement in relation to lobules. The liver cells vary considerably in size, the larger frequently contain two nuclei and are often vacuolated or show other signs of degeneration. The tracts of connective tissue between the hepatic islands are densely cellular and between the fibrillae are multitudes of small lymphocytes. Where the lymphocytic infiltration is less dense, spindle-shaped fibroblastic elements largely compose the tissue. There is a comparative absence of the increased duct formation common in other varieties of hepatic cirrhosis.

The condition of the spleen. In the entire series of cases enlargement of the spleen is the result. Distinct and sometimes great enlargement of the spleen is more regulary associated in Egypt with cirrhosis of the liver than with conditions unconnected primarily with this organ. The greatest degree of enlargement is found in cases where the cirrhosis is of the more advanced and contracted type. In several such cases the weight of the spleen has been 1000 and 1250 grammes; and in one case, a girl of fourteen with advanced cirrhosis, the weights of the liver and spleen were identical viz: 1450 grammes. In consistence the spleen is firm, frequently indeed quite hard, and presents a uniformly and deeply congested pulp, in which the Malpighian bodies are generally only detected with difficulty. The pathological condition of the spleen may be summarised as follows:—(1) Hyperplasia of the lymphocytic elements of the pulp. (2) General increase of connective tissue, either in the form of a definite increase of the compact fibrous trabeculae or, in larger spleens, an infiltration of spindle-shaped cells diffusely distributed throughout the entire pulp. (3) Distension and congestion of the vascular sinuses and frequent interstitial haemorrhages. (4) Active phagocytosis on the part of the macrophages towards red corpuscles and leucocytes. The occurrence of intracellular pigment from the former source is commonly noted.

Condition of the intestine. There are no characteristic lesions in the intestine in this disease. Sometimes there are definite dysenteric ulcerations, either in an active or a chronic form. Or an enterocolitis of the lower part of the ileum and the whole length of the colon; and, occasionally, small oval ulcers in the colon: but no parasites have been found in sections from the walls of the intestine including the ulcer."

Day and Ferguson conclude that this disease is probably produced by an infective agent, as yet undiscovered, which is more likely to be protozoal in nature than bacterial. It is quite distinct from Kala-azar, malaria, bilharziosis and anchylostoma. It differs also from chronic splenic anaemia but corresponds almost exactly to Banti's disease; and "for the present, we may be content to remark that closely comparable if not identical forms of splenomegaly with hepatic cirrhosis occur both in the South of Europe and in the Northern part of the Egyptian Delta."

Having thus successfully classified the different varieties of this disease, Day naturally endeavoured to find some more satisfactory *method of treatment* than that hitherto adopted. Knowing that successful cases of splenectomy had been reported in splenic anaemia, he enlisted the services of his corresponding Surgeon, Mr. Richards; and between them they placed the surgical treatment on a proper basis and published their results in a paper entitled "Egyptian splenomegaly and its surgical treatment," in the Transactions of the Society of Tropical Medicine and Hygiene, July 1912, Vol. V., No 8, and it is on the conclusions of this communication we have been working ever since.

Day first gives some further information he has gleaned since the publication of his first paper and we cannot do better than give a fairly complete summary of the whole paper as it adds considerably to our knowledge of the disease. Thus he finds that the disease has a much broader distribution than was first supposed and is common in all parts of Upper and Lower Egypt. It is found in an easily recognisable form in no less than ten per cent of autopsies performed at Kasr-el-Ainy. Then, after re-quoting his former figures, he continues :—" Out of 100 infants under the age of four years brought to the medical clinic, 20 were found to have splenic enlargement, which in 7 reached a considerable grade and was associated with severe anaemia. Examination of the blood in these cases showed no sign of malaria.

The disease is common at all ages up to 30, but in infants and children is apt to run a severe course, while at a later age the chronic form progressing to ascites is the type almost exclusively encountered. The average age of infants attacked was fifteen months, the youngest was 2½ months old. After infancy the disease is less common, but again appears to be more prevalent after the age of eight. It is possible that a slight attack in infancy may confer an immunity for some years, and it is probable that the chronic cases in adults represent the results of repeated infections.

The poorer native classes are chiefly, if not exclusively, attacked and there is no distinction of sex. I have never seen a marked case in an upper class adult or in a resident European. Concomitant disorders are the rule rather than the exception. In infants the disease is generally associated with rickets, while in older patients bilharziosis is usually and anchylostomiasis often present."

The symptoms have been described generally in the previous paper but we shall briefly recapitulate them so as to give a clearer picture of the condition at the different ages and stages. " The essential features of the disease are the same for all ages and there is no need to distinguish a special infantile form. In babies, however, it commonly takes a severer and more rapid course. There is irregular fever, wasting, and striking pallor. The spleen is enlarged and firm and may reach to the umbilicus in severe cases, while the liver is also enlarged but of normal consistency. Vomiting and diarrhoea are frequent complications and in the last stages oedema, purpuric eruption, and broncho-pneumonia occur.

In older children and adults the commencement of the disease is usually indicated by fever lasting a few weeks or months. The fever is generally intermittent and irregular and is not lessened by the

administration of quinine. Afterwards a swelling of the spleen may be actually noticed by the patient or he may complain of more or less pain over the left side, causing discomfort after meals and a dragging pain on exertion. In many cases, particularly mild ones, the onset of the disease is insidious and may be masked by general weakness and anaemia, due to severe anchylostomiasis or bilharzia infection. In a third group a history of diarrhoea or dysentery may be obtained, but this is the exception rather than the rule. On physical examination the spleen is found enlarged firm and often tender. The liver generally shows a slight enlargement but is soft and difficult to feel, thus resembling a fatty organ.

With the further progress of the disease, the general symptoms of anaemia wasting and occasional fever become more apparent. Sudden rises of temperature for two or three days are seen in about a third of the patients. The spleen and liver both enlarge steadily and produce a characteristic expansion of the lower part of the thorax and upper part of the abdomen, by which this disease can generally be recognised on inspection. The costal angle has much widened, the recti generally separated above the umbilicus and the thoracic viscera displaced upwards, so that the apex may be seen in the fourth space. The hard spleen is felt a variable distance below the ribs, often extending half-way to the umbilicus; the liver is uniformly enlarged, smooth, and firmer in consistence than normal. It may even be overlapped by the spleen when there is much enlargement of both viscera. Fibrotic hardening and contraction mark the next stage. In mild cases the disease comes to a natural termination, leaving but slight marks of its passage; in others definite hepatic cirrhosis, with a persistently enlarged spleen ensues and may last indefinitely. Whenever the spleen is hard, although it may barely project beyond the costal margin, liver changes are always advanced.

Instead of running a mild course the disease may be subacute from the outset or show marked exacerbations from time to time. In such patients the spleen becomes greatly enlarged, often reaching to the umbilicus or beyond, while the liver is always cirrhosed, being hard and nodular to the touch. Its size may vary considerably and it is difficult to determine with accuracy owing to the great widening of the costal angle. The general symptoms of wasting debility and anaemia are pronounced; and pain, due to perisplenitic or perihepatic adhesions, is common. The patient often induces vomiting to relieve the great discomfort felt after a big meal. It is from this type of patient that most of the cases for splenectomy have been selected, provided the blood examination shows the proper picture.

The last stage is the development of ascites as a complication of the hepatic cirrhosis. With the onset of ascites the general signs become aggravated. The patient is always emaciated and the bodily exhaustion and the effects of the abdominal distension upon the thoracic viscera are prone to lead to fatal complications. On examination the contracted nodular liver can generally be felt in the costal angle and the spleen recognised by dipping. At this stage the spleen rarely shows great enlargement and it may not be palpable even after tapping, and it is often impossible to feel the liver. Occasionally ascites may appear earlier,

before the hepatic fibrosis has caused much contraction of the liver or irregularity of its surface. The characteristic blood changes are best seen in such advanced cases, but the anaemia is never profound enough to cause death of itself. Haematemesis is always uncommon but jaundice and coma from hepatic insufficiency are often seen at the close.

Blood changes in Egyptian splenomegaly. The blood picture varies with the acuteness of the disease and is often modified by complicating disorders. At the outset, particularly in infants, there is a distinct leucocytosis, due chiefly to an increase in the numbers of mononuclear and eosinophile cells. Later, when the fever has abated, this leucocytosis disappears and is succeeded by leucopenia with relative lymphocytosis, which is most marked when hepatic cirrhosis supervenes. The red corpuscles show a progressive diminution during the course of the disease and in the last stages may be reduced to well under two millions per c.mm. In such cases the red corpuscles exhibit considerable variations in size shape and staining properties, but nucleated forms are most rare. The haemoglobin is reduced a little more in proportion, the colour index being about 9. The anaemia is generally intensified by anchylostomiasis or bilharzia infection. In particular a greater loss of haemoglobin is caused by such complications, whilst the differential count shows a further increase of the eosinophile and large mononuclear cells at the expense of the polynuclear. In the late stages of the disease the presence of complications, such as bronchitis, often causes some polynuclear leucocytosis and obscures the typical leucocytic changes.

Appended are some figures based on the averages of a number of cases:—

	INFANTILE	ONSET (*adult*)	CHRONIC (*splenomegaly*)	ADVANCED (*ascites*)
Number of reds -	2,682,000	3,820,000	3,368,000	2,080,000
Number of whites -	8,100	10,000	3,993	3,750
DIFFERENTIAL:				
Polynuclear - -	33	54	51.2	56
Lymphocytes - -	45.5	30	32	22
Large Mononuclears	17.5	10	10.3	18
Eosinophiles - -	4	6	6.5	4

Complications. In Egypt the most common complications are due to rickets in infants, and worm infections and pellagra in after life. In weakly patients with much abdominal distension slight bronchitis is common and, owing to the deficient expansion of the bases of the lungs, congestion of the bases and a form of hypostatic pneumonia is common. This complication occurs in most patients after operation and is a frequent source of anxiety.

Duration and prognosis. The course of the disease is always protracted, especially in older children and adults. Hospital statistics show that there is a difference of three years between the average ages of patients admitted for splenomegaly and those suffering from ascites. The prognosis depends upon the activity of the disease and essentially on the state of the liver. In infants especially the disease often runs a rapid course, although, I believe, many slight cases recover. A very large

spleen means active disease often associated with fever and carries a bad prognosis at any age; and death may occur from exhaustion or hepatic insufficiency in such cases without the appearance of ascites. In mild cases the disease may come to a natural cure, little damage being inflicted on the liver. In severer cases, as long as the liver is not contracted to less than its normal size and the general wasting not extreme, a fatal termination is not to be feared in the immediate future. The anaemia is never severe enough to cause death and fatal thrombosis and haematemesis are rare.

Ascites is always an unfavourable symptom, and if the fluid rapidly re-accumulates after tapping, a fatal termination may be expected within six months of its onset. When there is not marked wasting, however, the ascites may disappear, at any rate, for a time. Any coincident disease, such as anchylostoma, bilharzia, pellagra or chronic diarrhoea, greatly intensifies the symptoms and makes the prognosis correspondingly grave."

Reference must be made to the former paper for details of the morbid anatomy; and attention to the essential symptoms described above make the diagnosis quite clear in most instances. The blood must always be examined and malaria, enteric, Malta and other tropical fevers excluded. The total and differential count must always be done and gives valuable information. Other points in the diagnosis have been mentioned before and Day especially points out the importance of the wide expansion of the costal angle, as evidence of previous enlargement of the viscera and not of a simple ascitic effusion like tuberculous peritonitis; and also the marked reduction in the numbers of the red cells and leucocytes even when the patient does not look anaemic.

Treatment. All sorts of medicinal measures have been tried without effecting anything beyond improving the general health to some extent or relieving symptoms. Even salvarsan has been tried and X-rays; but, in common with everything else, these have proved quite useless, and there only remains *radical treatment by splenectomy* and we must now examine the conditions favourable for this operation.

As regards the disease itself, the younger the patient and the shorter the history of splenic and hepatic enlargement, the better the result is likely to be. In Richards' series of 22 cases — published in the British Journal of Surgery for January 1914 — the cases were between the ages of seven and fifty, but only one case was over thirty and the average age was twenty. Acute exacerbations are likely to occur in very young patients and, though these indicate the advisability of early operation, the best cases are those in which the disease has taken on a sub-acute stage with enlarged spleen, anaemia, cirrhosis of the liver and the correct blood picture. The latter is most important and any degree of leucocytosis contra-indicates operation. The occurrence of ascites or of jaundice similarly negatives any thought of splenectomy; and, as Richards writes: "Probably the real position is that the risk of operation increases as the cirrhosis of the liver becomes more advanced; but that, in cases on the border line, so much improvement follows early careful treatment and

rest in hospital that an unsuitable case may sometimes be converted into a suitable one by this means." The patient's general condition, weak though it may be, must show some signs of improvement under proper medical treatment and building-up before operation can be thought of; and our regular practice is to submit all cases to a most careful preparation on these lines before operation. In addition to proper food tonics and iron, and other measures for combating anaemia, any anchylostoma worms must be got rid of by appropriate dosing; everything possible must be done to relieve any bilharzial condition that may be present; malaria and syphilis must be excluded; and a most careful examination of the blood must be carried out, and any other possible cause of fever, other than the disease we are considering, recognised. The condition of the lungs is also most important and chronic bronchitis collapse or broncho-pneumonia must be noted and steadily treated before operation. The condition of the heart and kidneys must be equally carefully noted; and attention to all these points often makes all the difference between success and failure, which may be due to the occurrence of post-operative complications on a hidden or undiscovered focus of disease, especially in the lungs.

The operation of splenectomy. The patient must be very carefully prepared as for any other abdominal operation and should be given a preliminary injection of morphia and atropine before chloroform is administered. A dose of 20 millions of pneumococcic vaccine is given the night before operation. A free incision is made through the left rectus muscle, extending up to the costal margin and down well beyond the apparent lower border of the enlarged spleen. Generally, the anterior border of the organ is at once exposed but covered by a thin layer of omentum. This is displaced or divided and the rest of the operation depends almost entirely on the adhesions that may be present. In easy cases the right hand can be now introduced into the abdomen and follows the outer surface of the spleen right up into the vault of the diaphragm, which often appears of great depth, in fact the spleen is always much larger than it appears on external examination for this reason. If there are no adhesions or only fine ones, which are easily broken by the entering hand, the spleen is pulled forward and delivered out of the wound, the lower pole being directed forwards by the left hand, until the organ lies entirely outside the abdomen. A towel is then tucked in behind it and the rest of the operation done entirely extra-abdominally. There is always a long separate leash of vessels in a thin fold of omentum, running down nearly to the lower margin of the hilus of the organ, which is first divided between silk ligatures; and then the rest of the pedicle is secured between two ligatures piece by piece, each large vessel or group of small vessels being first isolated by blunt dissection before being tied. These ligatures must be very carefully placed and tied not too close to each other or to the margins of the spleen or the stomach, our object being to ensure the complete and safe control of any possible bleeding vessels. Properly done the final result is a double row of ten to twenty ligatures, between which the intervening tissue has been divided progressively, and when the final piece is cut the spleen is removed by what should be practically a bloodless operation. The only bleeding there should be — and sometimes this is quite unavoidable — is that from the separation of adhesions and the possible tearing of spleen substance in the process.

The space from which the spleen has been removed is now carefully examined and cleared of blood clot with a large saline-soaked abdominal gauze sponge and the abdominal wall closed in layers, a few interrupted sutures of catgut drawing together the divided rectus muscle in addition to the usual sets of sutures. The skin is closed with clips, a few reinforcing sutures of silk-worm gut being inserted in the case of a specially long incision.

Reference must be made to the original paper, already quoted, by Richards and Day, for fuller details of the operative procedures on which, indeed, our later experience of the operation is based. To quote from this paper : — " The difficulty of the operation and the time it takes depends chiefly on the presence or absence of adhesions, which vary very much in extent and cannot be foreseen. There may be scarcely any, or the whole spleen may be so generally and densely adherent that removal is rendered quite impossible."

"Adhesions occur between the surface of the spleen and the omentum, the outer wall of the abdomen, the stomach and the colon, and the vault of the diaphragm, while the pedicle may become thickened and obscured. Sometimes they contain vessels of some size but, as a rule, any bleeding which takes place on their division is due to laceration of the capsule of the congested organ". When the adhesions cannot be broken down they must be divided between forceps and subsequently ligatured, often a very difficult matter as they are generally deep down in the abdomen. One is often tempted to drain the large space left after splenectomy, but it is not necessary as the abdominal viscera at once fall back into the vault of the diaphragm and soon obliterate it.

Haemorrhage may easily occur during the operation from rough handling of the pedicle or the tearing of firm adhesions, especially if a portion of the spleen is torn away at the same time. In such cases a pad should be pressed over the torn surface and the ligature of the pedicle and the removal of the organ proceeded with as quickly as possible.

The immediate *after-effect* of the operation is shock, which is largely due to haemorrhage and must be vigorously combated. These cases are in an enfeebled state on account of their disease and have been temporarily patched up for the operation, and it is only when the principal cause of their weakness is removed that they begin to really improve. If the shock is not severe, or as soon as it is sufficiently recovered from, the patient must be sat well up in the Fowler position and kept up ; as one of the most common and dangerous complications after operation is broncho-pneumonia and pleurisy, with or without some collapse of the lung. On the least suspicion of "chestiness" a further dose of pneumococcic vaccine – 50 million – must be given and very vigorous measures taken. Some cases go on to extensive collapse of the base of the lung and in a recent case a gangrenous abscess in this situation was opened with success. One of my cases developed a massive lobar pneumonia, while some degree of bronchitis is quite common. These lung complications are very real dangers and are best avoided by careful preliminary treatment, the use of pneumococcus vaccine, by postponing operation till the chest is quite clear, and by adopting the sitting position as soon as possible after operation.

For the rest, other complications after operation are not common and once the patient has rallied from the shock and does not become chesty, he usually does exceedingly well. The clips must be left in from for ten to fourteen days, as these cases sometimes show a very feeble healing reaction and the wound may easily gape if the clips or sutures are too early removed. Most cases wear a binder for three to four weeks and generally leave hospital without a belt, though it must be remembered that the inner half of the divided rectus muscle has had its nerve supply cut in the opening of the abdominal wall.

Mr. Richards records an experience of 22 cases of splenectomy in the British Journal of Surgery for January 1914 "of which four were fatal, in the sense that the patients died before they left hospital. In 2 cases operation had to be abandoned and both patients recovered. These two cases are reported but, of course, are not accounted as splenectomies. Five of these operations were performed by Dr. Aly Bey Ibrahim Ramez", whose valuable help throughout the whole series Mr. Richards gratefully acknowledges.

"Of the fatal cases, four in number, two had already ascites. One died on the third day with delirium and coma; while another was transferred to the medical side fourteen days after operation, developed portal thrombosis and died very soon after." These were among the early cases and we have all "since made it a rule not to operate on any case which has progressed to the stage of ascites". The third case died with a typical acute dilatation of the stomach; the fourth sank steadily and died the next day. He had double chronic pleurisy, a very fatty heart and kidneys, anchylostoma infection, and extensive bilharziosis of bladder ureters and rectum. Thus, excluding the two cases of ascites which we know now to be unsuited for operation, the mortality is 10 % which may be still further reduced with more careful selection of cases. In the last eleven cases there was one death."

The general results of the successful cases are very good. The leucocyte count goes rapidly up, the anaemia soon improves, and the patient becomes fat and well and remains so.

The *weight of the spleens* removed in Mr. Richards' cases ranged from 2780 to 535 grammes, with an average weight of 1350 grammes. The normal weight of the spleen is 170 grammes.

My own experience to date — June 1916 — includes 10 cases, with 3 deaths; and I propose to give a short summary of this series as it has taught me several valuable lessons.

The seven successful cases call for but little comment as they made uninterrupted recoveries, except for severe temporary post-operative shock in two cases and a mild degree of chest symptoms in others. The blood counts of the last two cases were particularly instructive. In one the W.B.C. before operation were 3800 and three weeks after had risen to 8000; while in the second from 6500 they rose to 11500, after the same interval.

The first fatal case should never have been touched as he had diffuse chronic bronchitis at the time of operation. The splenectomy was not difficult but he developed an acute lobar pneumonia of the *right* base two days after operation and, though he rallied well for some time, eventually died on the 12th day. Post-mortem revealed a solid lobar pneumonia of the two lower lobes of the right lung with general pleural adhesions and small bronchiectasis throughout both lungs. The operation area was perfect, without any sign of peritonitis or intestinal distension.

The second fatality occurred in a small boy of 7, from sepsis, apparently from infected sutures and ligatures. At the autopsy a collection of pus was found at the seat of operation, with localised peritonitis. The liver was large, swollen and soft, with no cirrhosis and there were patchy tubercles in the lungs and pleura. There was double hydronephrosis, marked bilharzial infection of the ureters, and a heavy bilharziosis of the bladder. There was also an extensive streptococcic cellulitis under the skin around the wound. This case was obviously not a true Egyptian splenomegaly – the spleen only weighed 250 grammes – and moreover the leucocytes rapidly increased in the last few days before operation until they reached 15000, probably due to the septic condition of the bladder and urinary tract generally. The operation was done on a hot windy dusty day, which may have been a contributory cause, though the ligature and suture material was probably mainly responsible for this unfortunate result.

The third case died under chloroform just as the operation had been completed, and proved to be a most interesting pathological subject; and, incidentally, a striking illustration of how the surgeon can be victimised by an unreliable medical examination and preparation for operation. The body was that of a poorly developed youth with entirely infantile genitals. The heart weighed 370 grammes — 150 grammes less than normal — the right side was hypertrophied and firm, the left soft flaccid and empty. The tricuspid orifice took four fingers and the right auricle was thin and dilated. The right ventricle was thick and hypertrophied. The aorta was very narrow, 5 cm. in circumference, and distinctly smaller than the pulmonary artery and of the same thickness. There was marked development of the conus arteriosus. Both lungs were very imperfectly divided into lobes and there was only a very faint sub-division of the left lung into two lobes, and a number of small nodules like tubercles were scattered throughout the lungs. There was a very much enlarged thymus, very bulky and lobulated, exceeding the volume of the thyroid, and extending far down on to the pericardial sac. The thyroid was normal but the larynx and trachea were quite infantile. There was nothing abnormal in the bed of the removed spleen and the liver was normal in size with a soft knobby monolobular cirrhosis like that of bilharzia. The kidneys were normal in size but very tough, and deeply purple as though long congested.

The post-mortem diagnosis was congenital heart disease, enlarged thymus, narrow aorta, interstitial fibrosis of lungs and chronic congestion of the kidneys; and it is small wonder that the boy died under chloroform with so much to handicap him.

The largest spleen in the last nine cases – of which I have reliable records — weighed 1930 grammes and the smallest 250. The average of the series was 920 grammes.

I have summarised my results at this length as they may serve as a guide to surgeons undertaking such operations for the first time and I would like to impress on them the importance of the most careful selection of cases, on the lines indicated above, and their proper medical preparation before operation.

Addendum—Since June 1916 I have operated on a further five cases with one death. There were four men and one small girl of 10, the other ages being 30, 24, 30 and 35. The average weight of the spleens removed in this series was 2094 grammes, the smallest being 1300 and the largest 3100.

Case 11 had some fluid in the peritoneal cavity and was theoretically almost too advanced a case to benefit by operation, but did splendidly and lost all his fluid. He had a spleen of 2060 grammes and a very hard enlarged nodular liver, which softened very considerably after operation. W.B.C. count before operation was 6250 and increased to 8000 before discharge.

Case 12 was a girl of 10 with a very large spleen and a four years' history of fever and splenic enlargement. She was very anaemic and in poor condition. The spleen weighed 2250 grammes and W.B.C. amounted to 3750 at time of operation and increased to 7000 — I quote from memory as I have mislaid the report — three weeks after. She had considerable reactionary temperature for ten days after operation but the wound healed perfectly and we could find nothing to account for the fever, which disappeared as her condition improved and her diet increased.

Case 13 was a policeman with rather indeterminate signs and symptoms, with a W.B.C. count of 4400 and a very large liver, which was found at operation to have a very dark mulberry-coloured surface with irregularly nodulated cirrhosis and a number of small cysts along its edge. The operation was difficult but was well finished. The patient was never comfortable afterwards and appeared to be developing a central pneumonia and became suddenly bad and died six days after operation. The superficial layers of the abdominal wound were quite firmly healed ; but deep to the rectus muscle, and involving the outer surface of the sutured peritoneum, was a filthy suppurating almost gangrenous area, obviously due to infected catgut which had been used for the sutures. The surface of the peritoneum under the incision was affected and the coils of gut adherent, but there was no generalised peritonitis. The pedicle was perfectly clean and the subdiaphragmatic space from which the spleen had been removed was quite normal. The heart was very flabby pale and fatty and the liver very cirrhotic and fatty also. Investigation showed that all the catgut we had been using was quite sterile, but the water from the cold steriliser in which the catgut was rinsed before being threaded into the needles, was contaminated with septic micro-organisms. Hot freshly sterilized normal saline solution is now used for this purpose.

Case 14 had a very large spleen and some enlargement of the liver with, in addition, a marked Fairley reaction for bilharziosis, which explained his eosinophilia of 10 per cent. W.B.C. count was 6000, which went up to 11000 three weeks after operation. The weight of the spleen was 3100 grammes and, though he was much distressed from his condition before operation, he did very well indeed and went out rejoicing a month later.

Case 15 had a lot of ascites but his general condition was sufficiently good to justify an attempt to improve his health by splenectomy. W.B.C. count was 3500, which increased to 12500 just before discharge; but I hardly think this was a genuine count as he had some fever, probably of malarial origin, at the time. We found quite a lot of fluid in the abdomen, reaching up to the umbilicus, but he never looked back and very soon improved in every way. He left hospital much better in general health but with a small amount of ascites. He had an eosinophilia of 9.5 % before operation, which is probably explained by the vomiting of a large ascaris the day after operation.

This series of cases were all difficult operations, as the pedicles were very broad and irregular and did not lend themselves at all kindly to ligatures, which had to be very carefully placed and tied. The two cases with fluid in the abdomen were theoretically beyond operation but were done in the hope of making them useful members of society, rather than leave them to go rapidly down hill, as was inevitable without operation. The results in both cases thoroughly justified our boldness.

I have since heard that the last case (No.15) was very ill in his "balad" (village), with fever and abdominal swelling, for sometime after operation; but I am now informed by the Steward of the School, Reis Khalil, who hails from his village, that he is now quite well and "as strong as a camel".

April 1918. Since the series reported above I have to mention another case of splenectomy, done on November 5th 1917, on a man of 35, for a spleen weighing 2275 grammes, which unfortunately died of haemorrhage from the partial slipping of a ligature off a prominent vein less than an hour after the completion of the operation. It was a very broad pedicle with many enormous veins, the congestion in which was unduly increased by ligaturing the splenic artery first. Recognising the necessity for care we had, as we thought, very thoroughly ligatured everything in small sections; and when we inspected the pedicle before closing the abdomen it appeared perfect and was quite dry, as was also the abdominal cavity. Just as the suturing was being completed the patient made a strong but abortive attempt to vomit, which evidently displaced one of the ligatures, as it was found at the post-mortem examination still in place, it is true, but half off the main vessel in that part of the pedicle, and there was a considerable quantity of fresh blood in the peritoneal cavity. It was specially unfortunate as, in the opinion of two of my colleagues assisting at the operation, it was one of the best and most bloodless splenectomies they had seen.

On April 3rd 1918 a further case was operated upon, the main interest of which is the fact that he comes from Arabia, his father being the head of the Beni Atieh. He is a boy of 15 with well-marked symptoms

in a comparatively early stage and has done well, though with some superificial sepsis in the wound, probably from accidental contamination during artificial respiration necessitated by bad breathing during anaesthesia. His spleen weighed 680.0 and the liver was quite large and soft and has already — a month since the operation — considerably diminished in size. His convalescence has been retarded by an attack of quartan malaria to which he is subject, though no blood changes could be detected before operation.

Later with still one more successful case since the above-mentioned my complete series of splenectomies to date, including only those of which I have proper notes, comprises 18 cases with a mortality of 5, and I am the first to admit that with proper selection and further experience this mortality should be very much reduced.

We have had three other successful cases ; two by Dr. Aly Bey Ibrahim Ramez, in one of whom a gangrenous abscess of the base of the lung developed and was opened and drained three weeks after operation ; and one by Dr. Aly Bey Ibrahim, in whom a large collection of blood, which had formed beneath the diaphragm, was evacuated through an exploring needle, 14 days after operation, with immediate relief and speedy convalescence.

We have thus records of 43 splenectomies for splenomegaly ; with 9 deaths directly or indirectly due to the operation.

The sequel of the last case in my series was very interesting, as he returned to hospital five months later with signs of intestinal obstruction; and Dr. Ibrahim Fahmy, who was the Surgeon-on-duty, found that two coils of small intestine were firmly adherent to the abdominal scar. These were released with rapid relief to the symptoms. A month later the patient became deeply, jaundiced, developed ascites and general oedema, and died very soon after, with all the symptoms of advanced cirrhosis of the liver.

Post-mortem, the heart was found to be in a condition of marked fatty degeneration, with a dilated right side but no valvular disease, and there was some congestion and oedema of the bases of the lungs. The liver was almost square in shape and the subject of a very advanced multilobular cirrhosis, with large knobs of fibrous tissue, some the size of a lime, and there were also large bands of fibrous tissue about the portal entrance. The liver only weighed 585 grammes. The kidneys showed advanced fatty degeneration. No bilharzia or anchylostoma were found.

The splenectomy in this case only postponed the further stages of the disease, but in the presence of such severe cirrhotic changes in the liver no real cure of the condition could be expected.

Included is a note I have written for the guidance of my medical colleagues to help them in the rather thankless task of preparing these cases for operation :—

INDICATIONS FOR OPERATION IN CASES OF EGYPTIAN SPLENOMEGALY.

The outlook is more favourable in young patients.

There must be an enlarged spleen ; an enlarged liver ; and the correct blood picture, with leucopenia, with W. B. C. between 3000 and 6500, polymorphs from 45 °/o — 60 °/o , and eosinophiles about 7 °/o on an average. There is generally some increase in the small lymphocytes also.

There must be no malaria, syphilis, or advanced bilharziosis.

Contra-indications to operation are ascites, jaundice, or any sign of hepatic insufficiency ; a very hard spleen and liver ; a W. B. C. count below 2500, or any sign of leucocytosis ; chronic bronchitis or other old lung condition ; prolonged or irregular fever ; and an absence of improvement in spite of prolonged medical and constitutional treatment.

Before operation is attempted the patient must have the above-mentioned indications for operation ; must have a negative W. R. ; show the blood negative for malaria, typhoid, or other fevers diagnosable by blood reactions ; have all the anchylostoma cleared out and bilharziosis treated as far as possible ; must have healthy kidneys in every respect, healthy heart and healthy lungs; must have any trace of bronchitis or other accidental lung condition thoroughly cured ; and must have had his anaemia and general feebleness treated by tonic, dietetic, and general constitutional treatment as thoroughly as possible.

The Medical Staff are requested to ask the Surgeon to see all cases of splenomegaly--except those with ascites--as soon as the quantitative and differential blood count has been done and indicates a promising result from splenectomy as above. Such cases can only be considered favourable when the W.R. and the search for malaria parasites have proved negative.

Any other surgical condition of the spleen is quite rare ; though, from time to time, *hydatid cyst,* either recent or suppurated, occurs ; and I have also seen *large single cysts* containing a bloodstained fluid and with walls of condensed spleen tissue. A similar cyst has also been met with in the liver.

We have recently operated on an extraordinary case in which the whole spleen had become the seat of an enormous abscess, containing much dark-brown gangrenous-like fluid, floating in which were some masses of dark sloughs, which were all that was left of the spleen. The whole organ had disappeared and the limits of the collection of fluid above were the diaphragm, and a matting together of the intestines with lymph in all other directions. It was thus entirely an intra-abdominal abscess but well shut off by firm adhesions from the general peritoneal cavity. The fluid was drained off through an incision below the costal margin and the cavity was very slow in closing. The patient had a history of recent malaria and subsequently had repeated attacks, during which the blood showed a severe double infection with benign tertian parasites.

I believe the case to be one of *necrotic liquefaction* of the spleen after malaria. The W. R. was positive at first but become negative later and as there was no other evidence of syphilis elsewhere I cannot think the condition was gummatous in origin, the positive W. R. being due simply to the malaria itself, as sometimes happens. A second case of the same kind has recently been in the hospital.

SUB-DIAPHRAGMATIC ABSCESS only occurs as a secondary complication to abscess of the liver and appendicitis and must be dealt with promptly, as soon as ever its presence is suspected or is confirmed by exploratory puncture. Its dangers in connection with liver abscess have been already described ; and in appendicular abscess, especially when the appendix is retro-caecally placed, it is always a source of grave danger. Free incision with excision of rib or ribs, and thorough drainage is early indicated, and counter openings are often called for.

The commoner conditions found in the OMENTUM AND MESENTERY are cysts, usually containing a serous-like fluid or sometimes blood, masses of tuberculous tissue, or multiple tuberculous glands in various stages of disease. I have seen a marked degree of tuberculous infiltration of the meso-appendix with involvement of the appendix and the adjacent caecum in dense tuberculous lymphy-like adhesions. We have also seen diffuse thick inflammatory thickening of the omentum and mesentery without being able to discover a focus either in gut or gland to explain it.

With the large number of cases of strangulated hernia in advanced degrees of inflammation, and neglected intestinal obstruction from any causes, SEPTIC THROMBOSIS OF THE MESENTERY and peritoneal folds generally is frequently seen and is of the gravest prognosis.

RETRO-PERITONEAL TUMOURS, generally sarcomatous in nature, are only too frequent and often assume enormous proportions. In young children these may be renal in origin and all have usually reached such a stage as to be already infiltrating the peritoneum and beyond any operative interference. Cysts originating in the root of the mesentery, hydatid cysts, multiple tuberculous glands, and osteo-sarcomata from pelvic bones or sacrum are sometimes discovered on exploratory laparotomy. The significant feature of retro-peritoneal growths apart from the irregular massive tumours is the extraordinary overdistension of the superficial veins of the abdominal wall, which in itself makes one take a very serious view of the case.

In connection with acute conditions in the lower abdomen, mention must be made of the frequency of ruptured EXTRA-UTERINE PREGNANCY, a condition requiring the promptest possible treatment by abdominal section for its relief. The signs of internal haemorrhage are usually very marked and, without delay and with the most careful anaesthesia, an incision is made in the middle line of the abdomen from the umbilicus to the pubis. The uterus is at once seized and pulled up out of the abdominal wound, the ruptured tube secured between clamps, and then firmly ligatured off and removed. The blood and clot is then turned out, but only when the bleeding point has been thus secured can measures be taken for stimulating the patient in every way, though already during the operation subcutaneous administration of normal saline solution has been practised. Firm bandaging of the extremities, especially the legs, is very effective in these bloodless cases ; and, once the abdomen, and especially the pelvis, has been cleared of clots, it should be quickly closed without drainage and every effort then devoted to the resuscitation of the patient, which, in many cases, is literally a resurrection. The details of this condition must be sought in gynaecological treatises, but so frequent and so dangerous is it that this brief mention cannot be considered out of place here.

In certain cases also of exceptionally large abdominal tumours, sometimes with ascites or jaundice or both, the primary growth is found in the *uterus* or *ovary*; the final stage being multiple sarcomatosis or carcinomatosis throughout the peritoneum and in practically every organ in the abdominal cavity.

The rare forms of INTESTINAL OBSTRUCTION, such as diaphragmatic hernia and the like, are so rare as to call for no further comment; but, perhaps more in Egypt than elsewhere, strangulated hernia is by far the commonest condition leading to obstructive symptoms. It must be remembered in this connection that appendicitis here only claims a comparatively small number of victims, and thus strangulated hernia, in either umbilical and inguinal regions, comes an easy first. This condition will be dealt with with hernia in general.

AFFECTIONS OF THE UMBILICUS. True umbilical *hernia,* or hernia through a hole in the linea alba above the umbilicus, are comparatively common and follow the usual European lines. They frequently become stangulated and vary in size from a tiny dimpling at the umbilicus to an enormous mass containing omentum and intestine permanently dwelling outside the abdominal cavity. The operation closely follows Mayo's procedure and the transverse skin wound is doubly secured by several deep mattress sutures of silk-worm gut and an anchored dressing.

Of *faecal fistulae* presenting at the umbilicus, we have seen a patent Meckel's diverticulum; but most cases are tuberculous in nature, with masses of the same kind in the abdomen and often also tuberculous ulceration of the intestines.

Rarely, an unoperated strangulated hernia opens at the umbilicus, bursts and ultimately leaves a fistulous opening; and even more rarely, bilharzia may be responsible for a similar condition.

Of *urinary umbilical fistulae,* though occasionally a persistent urachus has been found, bilharzia extending upwards from the bladder is the most common cause. This must be treated on the lines of a bilharzial fistula elsewhere, by opening up the whole track right down to the bladder and leaving it widely open to granulate up. Many of these bilharzial bladders have already become malignant and the ultimate prognosis is bad.

I have never seen a *biliary* umbilical fistula in Egypt and *ectopia vesicae* is almost as rare.

XXVI. HERNIA.

Our pre-war *statistics* at Kasr-el-Ainy show that over 200 cases of hernia are operated on each year — equal to one-eighth of the total admissions for surgical diseases. The numbers are decreasing as more and more cases are being done in the provincial hospitals, where the staffs, which consist of our graduates, are rapidly becoming more skilled in operative work. Not all the cases admitted to hospital are submitted to operation. Some are refused owing to their enormous size, as no operation is likely to be completed, owing to the impossibility of separating adhesions, and the accumulation of fat in the mesentery or omentum in the sac, which prevents the return of the gut into the abdomen. Others have to be left from the presence of various complications, such as old age, general feebleness, enlarged prostate etc. More than 18 % of the admissions for hernia were strangulated and required immediate operation — 38 cases out of 221 in 1912 — and only five died, a very gratifying result considering the delay in seeking treatment — often several days — and the consequent desperate condition in which the patients are admitted. The mortality after operation for hernia of all kinds other than strangulated is barely 1 % for 1912–13.

We cannot throw any new light on the *causation of hernia*, our cases coming impartially from all classes of the population, hard manual labourers and sedentary folk alike; but we almost invariably find on careful dissection that cases of *so-called congenital* hernia in children are really herniae into pre-existing sacs, the tunica vaginalis being present and formed in the usual normal manner. We occasionally find a *true* congenital hernia in adults, and usually without any history or distinctive symptoms to lead us to suspect it before operation.

The native porter is accustomed to carry enormous weights on his shoulders and back, but is not on that account specially prone to hernia, and I have never been able to satisfy myself that heavy physical work contributes in any considerable degree to the production of hernia.

Passing in review the *causes of hernia* as detailed in Rose and Carless and considering them in their local bearings, we find, as elsewhere, an enormous preponderance of indirect inguinal hernia over all other forms. The true congenital variety is exceedingly rare though, judging by our experience in children, there are many instances of the descent of a hernia into pre-existing congenital processes, probably formed as offshoots from the funicular process, during the development of the tunica vaginalis. Almost without exception this is the condition found in quite small children. Careful dissection discloses a perfectly formed and closed tunica vaginalis and a very long narrow sac, running in the situation of the spermatic cord.

Among other congenital conditions, undescended or partially descended testicle is very uncommon in Egypt, and hardly contributes, if at all, to the causation of hernia.

We are familiar with cases of hernia associated with a general weakness of the lower part of the abdominal wall — Treves' hernia abdomen — in which there is an elongated bulging on coughing above and parallel to Poupart's ligament and a generally enfeebled and thin abdominal wall. We do not hesitate to operate on such cases, however, except in very old men, but are always careful to effect a good approximation of the conjoined tendon — which is mainly fibrous — to Poupart's and Gimbernat's ligaments and a good overlapping of the cut edges of the aponeurosis of the external oblique.

Cases presumably due to an abnormal length of the mesentery and other anatomical peculiarites have nothing essentially Egyptian about them; and the rare instance of hernia secondary to phimosis, stone, whooping cough, or other straining efforts in children, are almost always found to be occurring in an already present congenital process, as is the case in nearly all cases of hernia in infants and young children.

Hernia through an aperture in the linea alba is common enough; but umbilical hernia in children rarely occurs and almost never requires operation.

Incisional hernia must from time to time occur, after extensive abdominal operations and in cases requiring drainage or plugging; though such cases are commendably infrequent.

All the factors of chronic strain from exertion and over-exertion operate in Egypt as elsewhere ; though the national custom of defaecating in the squatting position probably does away with many of the risks of hernia-production from chronic constipation, and also from the straining incumbent on the passage of urine from an enlarged prostate, or stone, or chronic bilharzial urinary or rectal irritation.

As regards the *structure* of hernia, we have nothing to note specially, but can only repeat that from superstition, ignorance, or neglect, many cases assume quite enormous proportions before advice is sought. In these conditions the overloading of the omentum and mesentery with fat prevents any possibility of returning the contents of the hernia into the abdomen — the hernial contents have 'forfeited their right of domicile'— the presence of adhesions between sac and gut or omentum being usually only a secondary factor. All the various organs in the lower part of the abdomen are found from time to time in hernial sacs ; the bladder particularly frequently, as well as the caecum, either in the ordinary way or as a sliding hernia, and the appendix in both right and left-sided hernia.

Further reference to local peculiarities will be made in the sections on special herniae.

SPECIAL FORMS OF HERNIA. INGUINAL HERNIA. Of late years the views hitherto held regarding the formation of congential hernia have been much modified ; indeed, Hamilton Russell, who has epitomised his opinions in the Lancet of March 12th 1904, believes that there is no such thing as a true acquired hernia ; but that there is always a pre-existing sac, left by some irregularity of, or interference with, the development of the funicular process, and which is always ready for the reception of a portion of gut to complete the formation of a hernia. His views have

been very largely adopted and considerably simplify the former cumbersome classification of the varieties of congenital hernia. We have already noted that in infants, in whom there would hardly appear to have been time for an acquired sac to form, the conditions met with at operation show a perfectly formed tunica vaginalis and a long thin sac running in many cases along the whole length of the cord. The true congenital hernia will be the natural result of the complete patency — or non-obliteration — of the processus vaginalis. No tunica vaginalis is present, the testicle lying quite uncovered in the lower end of the hernial sac. The distinction between the so-called congenital hernia of the vaginal variety and that of the funicular type (Rose and Carless) is merely one of degree of non-obliteration of the processus vaginalis ; in the former case the whole process being patent, in the latter the upper part only, while the lower part has adhered to form the tunica vaginalis. These forms are best distinguished as *total funicular* and *partial funicular* hernia, which expresses the congenital origin of the hernia and their anatomical formation.

Similary the so-called *infantile hernia* (Rose and Carless) is explained as due to a part of the processus vaginalis, in its passage through the very actively developing abdominal wall, being caught by the muscles and held up; while the testis goes on and pulls down with it the other parts to form its own tunica vaginalis, the remainder being more or less perfectly obliterated. Thus an elongated pouch may be found containing gut and lying behind an upward extension of an enlarged tunica vaginalis ; or the pouch may lie more directly over the tunica and invaginating its summit before it. In the former case an incision has to be made through two layers of tunica before finding the true sac containing the hernia beyond it.

Femoral hernia develops in the same way in already-made pouches, which are primarily formed by a budding off of a tongue of peritoneum along the main vessel of the developing lower extremity. Direct inguinal hernia is due to a hernia descending into a congenital pouch situated to the inner side of the deep epigastric artery. Such sacs have been found on dissection and in patients who have never had hernia, the connection with the peritoneal cavity being too small to allow the protrusion of gut or omentum.

The inference to be drawn from these investigations and conclusions is that for the formation of a hernia, there must be present a pre-existing sac ; that the weakness in the abdominal wall in the inguinal region is not congenital but is an acquired weakness due to the existence of a hernia during a lengthened period ; that there is therefore no such thing as an acquired hernia and that the essential part of the operation for the radical cure of hernia is the removal of the sac, and the obliteration of any secondary pouch above it that may have been produced by the constant downward pressure of the hernia itself. The rest of the operation is the repairing of an abdominal wall weakened by the pressure and presence of the hernia. These conclusions are very largely confirmed by practical experience and are becoming very generally accepted both in their anatomical and operative bearings.

The classical *signs and symptoms* of inguinal hernia and its diagnosis must be studied both in the ordinary text books and in the wards, and it only remains for us to record the results of a very extensive local experience in the *operative treatment* of this condition.

Trusses do not find very much favour among our patients, though many forms of weird and wonderful and totally ineffective instruments are exposed for sale in the bazaars. Naturally there are a certain number of cases, in whom operation, for one reason or another, is contra-indicated, who have to wear a truss ; and in my experience, especially when dealing with the better class Egyptian, who runs very much and very early to fat, the popular 'bandage Barrere', properly fitted, is very effective. In exceedingly fat people it is an advantage to have the double bandage. In irreducible hernia a bag truss made of thin leather or canvas is a safeguard ; and in extreme cases I have had these made, like a large nose-bag, with long webbing or leather straps, which pass round the neck and shoulders and so suspend the mass with much comfort to the patient. In competent hands all the ordinary forms of trusses may be used from time to time ; but at best one realises that such aids are only makeshifts and, whenever it is reasonably possible, an attempt should be made to effect a more definite improvement, if not a radical cure, by operation. In this connection the improvement in modern methods of technique and the careful and judicious use of spinal anaesthesia have considerably reduced the number of impossible operations. In fact, the rule now should be to submit every case of hernia to operation, unless there is a perfectly clear indication to the contrary.

The operative treatment of inguinal hernia. The main principles of the operation usually practised at Kasr-el-Ainy have been described in a previous section on aseptic technique ; and we propose in this place to mention some further practical points which have become part of our routine procedure in such cases. Thus the incision must be made well above Poupart's ligament, parallel to it, and extending down almost to the neck of the scrotum but not into it. The site of the enlarged external ring lies directly under the lower third of the incision. All bleeding points are at once secured with forceps and gauze pads attached to the cut edges of the wound all round. The aponeurosis of the external oblique is divided in the same line as the skin and for the whole length of the wound, splitting the external ring in its lower part. The lower flap is separated up on its under surface till Poupart's ligament is thoroughly exposed and also Gimbernat's ligament; and the upper flap similarly separated to define the conjoined tendon and above it the muscular fibres of the internal oblique. These two flaps are held out of the way with forceps ; the ilio-inguinal nerve, which is lying on the exposed internal oblique, is divided at the upper end of the wound and below and the intervening piece removed, to prevent any possibility of its being caught up in the scar of the operation and leading to neuralgia subsequently.

The isolation and separation of the sac is now effected in the usual fashion by dividing the cremaster muscle and fascia and then proceeding with a blunt dissector and a gauze swab on the finger to clear off the whole cord and the vas from the sac itself. Finally the neck of the sac is thoroughly cleared right up to its exit from the peritoneum at or even

beyond the internal ring. In an ordinary case the contents of the hernia are carefully squeezed back, the apex of the sac opened and its interior explored. If there are no adhesions of omentum or gut the sac is transfixed by a round-bodied curved needle as high up as possible. The sac is pulled down before transfixion and the direction of the needle is guided by sight both outside and inside the sac. As the ligature — of strong formaline iodine catgut — is tied the sac is held open, to prevent any possibility of the gut or omentum being included in the ligature, and externally the loop must keep clear of the cord and the vas. The bulk of the sac is now cut off, the pedicle again examined, and the tied ligature held loosely when the pedicle should then disappear at once under the muscular wall and be no more seen. If this slipping-up does not occur, each long end of the ligature must be threaded on a needle and passed through the muscles of the abdominal wall from the under surface in the direction of the anterior superior iliac spine. The two ends are then tied on the external surface of the muscles. In this way the pedicle of the sac is drawn up under the muscles and fixed at some distance from its actual point of exit from the peritoneal cavity. This procedure effectively prevents the possibility of a pouch being left at the site of the neck of the hernial sac.

In many cases also the deep epigastric artery and vein present on the inner side of the sac, or of the stretched peritoneum above it, and then the ligature must be tied a short distance below the vessel and the sac tucked up under the muscles in rather an upward direction. Care must always be taken of this artery, as troublesome bleeding may result from its injury.

When the neck of the sac is broad, which may occur in very old and large herniae, or in quite an early bubonocele, the transfixion must be done by passing a continuous suture backwards and forwards through the walls of the sac, and if possible finishing it off by tying the ends round the pedicle to imitate a true transfixion. In all these cases the pedicle must be tucked under the muscles and secured as before in the most convenient direction.

Finally, the neck of the sac may be much thickened by the presence of much fat-laden retro-peritoneal tissue, in which case the transfixion ligature must only be tied after a careful examination has shown that the fat is covered by a serous membrane and is really wall of sac and not adherent omentum.

Having disposed of the sac in one of these several ways, the cord, with the vas, is left just where it is, and the internal oblique and the conjoined tendon sutured down to Poupart's ligament, and really to Poupart's and not to any more superficial part of the under surface of the external oblique aponeurosis. The upper suture is inserted well above the site of the internal ring and the lower into Gimbernat's ligament, leaving only enough room to prevent pressure on the cord as it passes over the pectineal line to the scrotum. Thick catgut is used as for the neck of the sac and care must be taken in inserting the needle not to traverse the peritoneal cavity, or even the gut, above; or the femoral artery or vein, just as they emerge from the lower border of Poupart's ligament, below. The conjoined tendon varies very much in structure and

if it is mainly tendinous, extra care must be taken in the suturing, but at the same time too many sutures must not be inserted or the tissue will tear. In certain cases the conjoined tendon is altogether too weak to promise any support or holding power ; and in this event the incision may be prolonged inwards and the anterior layer of the rectus sheath split and turned outwards as a flap and securely sutured down to Poupart's and Gimbernat's ligaments. This manoeuvre is especially useful when, as not infrequently happens, a portion of the bladder is prolapsed into the hernial sac itself or, more often, bulges its way through the abdominal wall to the inner side of the internal ring.

The aponeurosis of the external oblique is next sutured by overlapping the upper flap under the lower and finally suturing the cut edge of the lower flap firmly to the aponeurosis of the abdominal wall well above the original position of the inguinal canal. For this a finer catgut is used. All signs of oozing having been stopped, the skin is now closed with clips, any serum or blood in the wound expressed, and iodine applied.

A piece of dressing is laid on the wound ; and, when the patient is back in the ward, a small elongated sand-bag is placed on the wound over a thin layer of gauze or dressing for from four to eight hours to prevent any oozing. The wound is painted every day with iodine and left quite exposed, except for a piece of dressing which is laid over the area of operation. The clips are removed in six to eight days, the patient gets up in from 8–10 days and goes out in from 12–14 days, without any bandage or truss.

In a fat patient some mattress sutures of silk-worm gut are inserted well wide of the incision and drawn tight after the clips have been applied to the cut edges. A mass of dressing and a firm bandage are applied for three or four days, when the sutures are removed and the case treated as above described; or an anchored dressing is fixed as described in a previous section on an aseptic operation.Should serum accumulate in spite of these precautions it should be aspirated off as often as may be necessary, or allowed to absorb of itself, which is not to be advised as it may lead to some weakness in the scar.

In the course of an operation for hernia both *varicocele* and *hydrocele* may require radical treatment and this in no way differs from that of these conditions uncomplicated by hernia.

In cases of *bubonocele*, or early more pronounced inguinal hernia, an operation I first saw done by Mr Clayton-Greene, is very effective. A rather shorter-than-usual incision is made through the skin and the aponeurosis divided in the length of the incision, but not down into the external ring. By dissection with two dissecting forceps at the lower margin of the internal oblique, after separating the upper loops of the cremaster in the direction of their fibres, the sac is soon exposed and cleared of all its surrounding relations right up to the internal ring. Here it is transfixed as usual – in many cases the cord is not seen except as it issues from the internal ring — and the operation completed by the usual repairing deep sutures from conjoined tendon to Poupart's and Gimbernat's and the aponeurosis sutured by overlapping, after a fine catgut suture has closed the gap in the cremaster. An anchored dressing is applied.

Recurrence after a thorough operation on these lines is very unusual, but should it occur, either after our own or someone else's operation, a very careful dissection is necessary, after resecting the cicatrix in the skin, to try and define the various layers overlying the sac. The sac, which may be merely a bulging through a weak abdominal wall, must be then dealt with as necessary, and as far as possible each layer must be re-sutured in order, and if possible, by overlapping, so as to make a strong block of tissue which will form an effective barrier against a further recurrence.

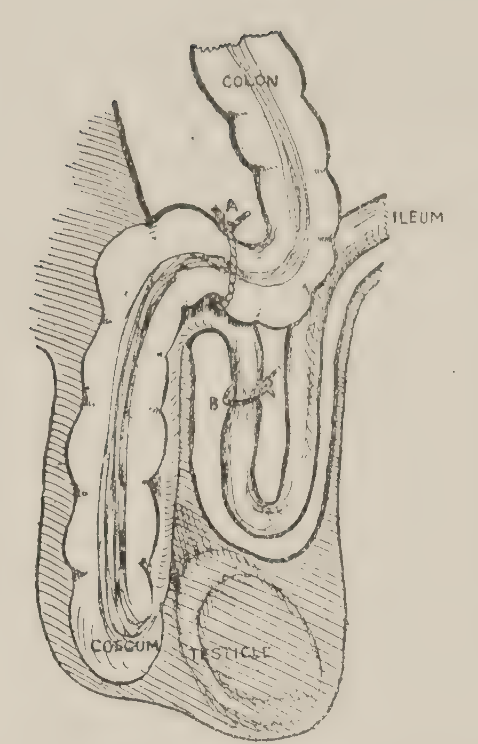
Incisional hernia occurring in a wound left after abdominal section must be treated on similar lines.

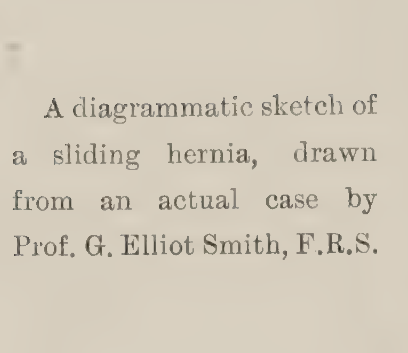
The operation for a true congenital, or total funicular, hernia differs from the ordinary operation only in the treatment of the sac, which is opened by a longitudinal incision and cut across midway between the testis and the ring, the incision through the posterior layer being very gently done to avoid cutting the vas. With care and patience the sac is soon separated and dealt with as above. The lower end may be fashioned into a tunica vaginalis by sutures, but is best cut away right down to the testis, leaving the posterior wall and the portion on the face of the testicle intact.

Direct hernia of any kind is treated by a thorough isolation and high transfixion of the sac and the closure of the gap in the abdominal wall by appropriate suturing. The unusual relation of the epigastric artery to the outer side of the neck of the sac must be remembered.

Irreducible hernia must be treated by operation as the condition found in the sac demands. This consists mainly in separating adhesions and in then completing the operation as for a reducible hernia. Sometimes it may even be necessary to resect a portion of the gut, and in all cases the possibility of completing the operation must be first considered after opening the sac, as in many instances the procedure promises to be so lengthy and complicated as to be quite unjustifiable. We have no special Egyptian features to chronicle in irreducible hernia except to draw attention to the frequency of overloading of the omentum and mesentery with fat. If operation is possible it is entirely dependent upon the condition disclosed on examination.

Sliding hernia. We are frequently surprised on opening a hernial sac to find that we cannot reduce the gut, though there is evidently no adhesion to prevent it. Closer examination shows that though there is apparently an ordinary sac, generally containing some small intestine and sometimes a portion of the large, there still remains often a considerable length of large intestine firmly incorporated with the posterior wall. Nothing we can do will return this colon ; and it means that either the ascending or the descending colon, depending on the side of the hernia, has slid down behind the posterior layer of the peritoneum through the inguinal canal and is now pushing the posterior layer of the hernial sac before it. High up the colon is still covered by peritoneum on its anterior surface but the portion which slips down and enters into the scrotum is entirely uncovered and soon becomes firmly adherent to the loose retroperitoneal tissue all round it and reduction is impossible. The condition is only discovered on operation and is often exceedingly difficult to treat.





A diagrammatic sketch of a sliding hernia, drawn from an actual case by Prof. G. Elliot Smith, F.R.S.

The prolapsed caecum with the lower part of the colon was so adherent that it was necessary to perform a resection of the herniated portion, and unite the colon at A to the ileum at B; and then to deal with the sac in the ordinary way. The patient made a good recovery.

In *early* cases, when the colon is not yet firmly fixed to the posterior wall of the scrotum, it is sometimes possible to dissect up a flap of the posterior wall of the sac with its base above, leaving the colon still attached to it, and then to push up the colon and the flap behind the neck of the sac. The rest of the sac, anteriorly and laterally, is cleared and ligatured, the ligature including also the cut edges of the posterior wall. The inguinal canal is now repaired very thoroughly, after the stump of the sac has been anchored under the internal oblique in the best possible position. At a rather *later* stage the posterior wall of the sac may be cut across transversely at the neck of the scrotum and its upper piece dissected upwards from the underlying colon into the ring. Another transverse incision is made below the level of the loop of the colon and a longitudinal incision on either side well beyond the limits of the gut. This square of peritoneum is dissected up at the sides till only the central part immediately overlying the colon is still attached. The connective tissue all round the colon is now opened up and the gut freed as far up into the ring as possible. The lateral cut edges of the flap made from the posterior wall of the sac are then sutured behind round the isolated gut to provide it with a peritoneal surface, and the gut is then pushed up into the retroperitoneal space as before and the operation completed as in the former case. Too often, however, so much of the colon has come down, and it has become so firmly adherent and widely spread out behind the sac, that nothing short of a very extensive resection of the prolapsed portion of the colon — which may include the caecum — must be practised. Before attempting such a radical procedure — and this condition especially occurs in oldish people — the case must be considered from the point of view of the patient as well as the possible local after-result ; and it may be wiser simply to close the neck of the sac, to prevent any further descent of the small intestine, and to leave the colon as it is, and the patient with an inevitable irreducible hernia for which an appropriate truss may be fitted. It generally happens that one is able to devise some means at the operation to effect a partial if not a complete reduction of the prolapsed colon ; but so diverse are the appearances presented, that it is impossible to lay down more definite lines of treatment than those indicated above.

Strangulated hernia. As is only natural in our class of practice, neglected cases of obstruction or strangulation frequently occur; and in addition to the well-recognised conditions that may simulate it, we have also to exclude endemic funiculitis before making our diagnosis. Most cases, unfortunately, are only too obvious and in practice we make no distinction between inflamed, obstructed, or strangulated hernia, but *operate at once*, the steps of the operation depending upon the conditions found after exposure of the sac and its contents. A free incision is made over the swelling extending from well above the site of the internal ring to half-way down the scrotum. This incision is cautiously deepened and each layer divided in turn till the sac is reached. If the deeper layers have been divided in the whole length of the incision the neck of the sac ought now to be free. The aponeurosis of the external oblique is now divided above the site of the external ring and in this way the sac, still containing its contents is freely isolated and brought down. The sac is now opened freely below the site of the external ring and in most cases a large quantity of blood-stained fluid comes away. The contents of the sac are now seen and carefully examined. Keeping the whole strangulated part in view and taking care to prevent it slipping back into the abdomen, the external ring is now divided from above and any internal source of constriction divided by cutting directly upwards with a scalpel or hernia knife, after which the gut is gently pulled down and the site of the constriction carefully examined. If this is not badly injured and the gut above is healthy, and the loop in the sac has resumed its proper colour, though it may be considerably reddened and inflamed, the contents, whether intestine or omentum or both, may be returned to the abdomen, and the operation completed as for a radical cure.

If the gut is gangrenous or injured beyond recovery the whole loop must be freely excised, the section being made well above the site of the strangulation. A similar course must be followed if ulceration has occurred at the constriction, though on a much smaller scale, the only condition being that the resection must be done through healthy gut.

In the preceding cases our course of action is quite clear but, if we are in doubt of the possibility of the gut recovering, or fear perforation at the site of the constriction, it is best to pull the whole loop well down into the bottom of the open sac and prevent it from slipping back into the abdomen by looping a piece of gauze through the mesentery and lightly packing the neck of the sac. Continuous warm saline fomentations are applied to the exposed gut and within 36 hours the case has decided for itself. If it all recovers, it is returned, after any adhesions that may have formed are separated, and the operation completed. Should, however, a perforation form or the loop or a portion of it die, an artificial anus is formed and allowed to persist till conditions are favourable for a resection of the gut or of some form of intestinal anastomosis. Working on these principles our results are very satisfactory in what frequently appear to be very desperate cases.

FEMORAL HERNIA is not at all common and presents no special local characteristics. The operation we do for this condition is not at all

original with us but has not yet found its way into the text-books and must be briefly described.

The first incision is similar to that for an inguinal hernia but is closer to Poupart's ligament, and its middle point lies over the neck of the sac ; or, rather, over the place where the neck of the sac leaves the peritoneal cavity, which is above the junction of the lower and middle thirds of Poupart's ligament. This incision is deepened through the aponeurosis of the external oblique and the short lower flap of aponeurosis is pulled down and separated by blunt dissection to expose Poupart's ligament. The upper flap is turned up also and the neck of the sac, as it comes out of the recurving edge of the peritoneum, is exposed and freed all round. In a fairly recent case this may be cleared so as to allow the index finger to be looped round the neck. While still holding the sac up a vertical incision is now made through the skin below Poupart's ligament, directly down on to the position of the sac in the upper part of the thigh. Here again the body of the sac is exposed and dissected out from its surroundings and freed right up to the neck. The incision in the thigh is temporarily packed with gauze and the operation proceeds through the upper incision, in which the sac is freed thoroughly from below and followed right up to its origin from the peritoneum. It is then opened, its contents, if any, returned, and its neck transfixed and ligatured as in the operation for inguinal hernia, though neither the spermatic cord nor the vas is seen. If the hernia is not completely reducible the sac must be opened in the thigh, the adhesion dealt with and the contents returned. The operation is completed by pulling a stitch or two across the opening of the crural canal, closing, the skin of the vertical wound, and then stitching the lower margin of the internal oblique to Poupart's ligament as in an operation for inguinal hernia, overlapping the two flaps of the external oblique aponeurosis and applying clips or sutures to the skin incision.

A strangulated femoral hernia must be treated by exposing the sac in the thigh, relieving the strangulation by cutting inwards at the neck of the crural canal and dealing with the gut as may be necessary. Whenever possible, a radical cure must then be performed as described above.

UMBILICAL HERNIA. In cases of protrusion of the umbilical scar in *infants and very young children* a half-piastre piece should be buried between two layers of strapping and placed over the umbilicus, and retained in position by fixing the strapping round the abdomen. After quite a short time a cure is effected in most cases; but if it persists and tends to become larger an operation should be performed. This consists in dissecting out the sac and transfixing its broad neck, by stitching it backwards and forwards, and then defining and suturing the various layers of the abdominal wall in order.

In the *umbilical hernia of adults* it is always wise to operate, as strangulation is very liable to occur, and generally there is no hope of controlling the hernia satisfactorily with a truss. It is often found that a so-called umbilical hernia really protrudes from a hole in the middle line of the abdomen just above the true umbilicus and, whether this is its mode of origin, or it is a true hernia in the upper part of the umbilicus,

itself, the treatment is the same. Except in quite a small case a transverse incision is to be preferred, the sac, which may be quite thin, or on the other hand may consist of quite a thick fibrous tissue with a peritoneal lining, is isolated right up to its origin beneath the rectus muscle, where it may be largely welded with the posterior layer of the sheath of this muscle. In a small case the separation can be effected without opening the sac, in which case the next stage of the operation consists in opening the sac and returning all its contents. The body of the sac is then cut away and enough left to form two flaps which are overlapped from below upwards, a short incision being made laterally in the sac on each side to facilitate the sliding of the lower flap under the upper. The edges of the gap in the middle line are then freshened and sutured in layers and, if necessary, two other flaps may be made from the anterior layer of the sheath and overlapped as will be presently described.

In the more extensive cases two long transverse incisions are made through the skin, enclosing an elongated elliptical portion of skin on the summit of the hernia. The sac is opened by deepening these incisions, and the contents returned to the abdomen, which is often a very difficult matter owing to the mass of fatty omentum within it and the complicated adhesions of the gut and omentum to themselves and to the sac walls. As much omental fat as possible should be removed and, when all has been returned and the neck seen to be quite free of adherent gut or omentum, a temporary gauze plug is placed in the peritoneal opening and attention turned to the sac itself. This may be a very thin membrane, derived mainly from the peritoneum lining the anterior wall of the abdomen and strengthened at its neck by fibrous tissue from the posterior layer of the rectus sheath. In other cases it is altogether thicker. In either case it should be cleared well up to the anterior layer of the sheath all round. This layer is then incised by a circular incision and the peritoneal neck of the sac defined, cut off fairly short and sutured by backward and forward stitches, and if possible with overlapping flaps till it forms a firm barrier, filling in the opening of the abdominal wall like a plug. The anterior layer of the rectus sheath is now clearly defined all round the opening and especially laterally. Two flaps are now made by cutting transversely through the anterior layer of the sheath from the outer margin of one rectus muscle to the other, skirting round the hernial opening above and below. The cut edges are separated up from the underlying muscles everywhere and sutured in such a way that one flap overlaps the other and so forms a firm barrier over the original defect in the abdominal wall. Strong formaline iodine catgut may be used throughout or fine silkworm gut. The skin is then closed with deep mattress sutures, with clips for the cut edges, leaving a long transverse wound.

Where there is much separation between the recti muscles, the anterior layer of the sheath may be best slit vertically on each side at some distance from the gap. The two inner pieces are then dissected up from the muscle and firmly sutured by overlapping from side to side; and, in extreme cases with a weakened rectus muscle, the outer portions of the split sheath may be separated and sutured to each other by their inner margins over the top of the other series of sutures. This procedure is often very useful, and I had been practising it for some time and had it in Mss. to publish, when a paper by Moynihan in the Lancet of July 23rd 1904 showed me that I had been anticipated by several other surgeons.

The dangers and frequency of strangulation in umbilical hernia must be recalled and also the contra-indications for operation in severe cases.

Hernia through an opening in the linea alba occurs mainly above the umbilicus in the middle line of the abdomen and calls for operation, which is performed in precisely the same manner as that for umbilical hernia of mild degree. Overlapping of flaps from the rectus sheath, either from side to side or from above downwards, is usually employed, after ligature of what may be quite a tiny sac in the midst of a mass of extra-peritoneal fat.

These paragraphs do not by any means exhaust our experience of hernia but sufficiently indicate the general practice we follow in Kasr-el-Ainy, where our wards are in constant danger of being over-crowded with such cases. In all the rarer varieties of hernia, and in other parts of this large subject we have not specially mentioned, we conform to the established principles of treatment common to modern hospitals in all parts of the globe.

The following notes are circulated to the house surgeons as a guide to THE IMMEDIATE AFTER-TREATMENT OF OPERATIONS FOR HERNIA AND HYDROCELE. When an ordinary operation on an inguinal or femoral hernia is completed in the operation theatre, the operation wound is painted with iodine and a piece of dressing laid on the wound and, if necessary, lightly secured in place by a few turns of bandage.

When the patient is back in bed, the dressing is removed and a piece of gauze placed over the wound, and on the gauze a small oblong sand-bag, which need only be rather longer than the length of the operation wound. In a double hernia two bags are required, and, if necessary, the bags may be kept in place by a few turns of bandage. The bags are kept on from four to eight hours, according to the extent of the deep dissection required at the operation, and should not be removed without reference being made to the House Surgeon who was present at the operation.

Once the bags have been removed a piece of dressing is laid over the wound, which is painted daily with iodine.

Should there be any accumulation of serum which does not tend to subside within forty-eight hours, this must be aseptically aspirated and a pad of dressing bandaged on for two days to prevent re-accumulation. The aspiration may require to be repeated.

When for any reason it is necessary to apply firm pressure by bandaging after the operation, this must be done in the theatre over a thick mass of dressing and left untouched for at least forty-eight hours. The subsequent treatment will depend on the conditions of the case.

After operation for *hydrocele* the scrotum must be raised on a special thin board – scrotal shelf—and an ice-bag, suspended from a cradle, applied for from three to six hours, to prevent the risk of oozing within the scrotum and the onset of orchitis. After the removal of the ice-bag, which lies on a piece of gauze covering the wound as with hernia, iodine is applied daily and a piece of dressing laid on. After the removal of the clips, in from five to seven days, the shelf is removed, and a suspensory bandage worn when the patient gets up, and this he continues to wear for a month after operation.

When both hernia and hydrocele have been operated on at the same time, the two procedures are to be combined.

XXVII. DISEASES OF THE RECTUM AND ANUS.

The principal conditions we have to deal with in Egypt about the anus and rectum are BILHARZIAL FISTULAE, PROLAPSE and PILES. As a contrast to the extraordinary frequency of these conditions we must again draw attention to the rarity of rectal cancer. A few cases of epithelioma of the anus or the lower inch or two of the rectum engrafted on to a bilharzial ulceration are seen from time to time; but an operation for the classical carcinoma of the upper portion of the rectum or sigmoid is almost unknown in Kasr-el-Ainy. Stricture of the rectum, whether of syphilitic or malignant origin, is very rare also; though it does occur after there has been extensive destruction of the lower part of the rectum from old biharzial fistulae and scarring.

IMPERFORATE ANUS in its various forms is more often brought to hospital than formerly and appears to be the most common of all congenital deformities among our hospital patients. It occurs in both male and female infants, is treated on the usual lines, and has a mortality approaching one hundred per cent. I have never seen a case live for longer than three weeks; but have reported one case in which an opening was made into a bulging in the perinaeum by the father, with a red-hot nail, when the child was three days old; and with such success that the child lived till he was three years, when a more radical operation at our hands caused too rapid an emptying of an enormously dilated rectum and sigmoid and death resulted from a kind of deferred shock.

In considering the question of diseased conditions of the anus and lower end of the rectum in Egypt, BILHARZIA, in all its varied forms in this situation, must first be excluded. These different appearances have been already described in the sections on surgical diseases of the intestinal tract, and on spirochaetosis and ulceration; but must again be referred to here to make our summary of the local conditions complete.

BILHARZIOSIS OF THE RECTUM. Our knowledge of the earlier stages of infection with bilharzia has been considerably enlarged by the presence in Egypt of large numbers of British and Australian soldiers during the war; and many interesting investigations and experiments have been done with very conclusive results. The first intimation I received on this subject was from Capt. Lawton of the Australian Medical Service, who was then attached to the 4th Australian General Hospital in Cairo, in September 1916. He had traced several cases of Australian soldiers who had been on duty near Tel-el-Kebir, who admitted having bathed in the fresh-water canal near the camp and who were subsequently seized, 3-4 weeks later, with pain low down in the abdomen, rigors, sweating and fever, the temperature running up to 105 F. even, and all with some pulmonary congestion at the bases. They all had intestinal irritation, generally in the form of diarrhoea, and at a later period passed many lateral-spined ova in the faeces with much mucus and tenesmus. These were evidently

cases of early infection with B. Mansoni. With the transfer of his hospital to France, Capt. Lawton was no longer able to continue his researches; but Capt. N. Hamilton Fairley of the 14th Australian General Hospital has continued and amplified the work, and has written an entirely new chapter on the early infections of this disease, which ranks almost as a classic, supplementary to the discovery of the intermediate host by Leiper. Fairley's work has succeeded in filling in all the gaps in the story of the disease and in tracing the infection from the very fountain-head; and so thorough have been his investigations upon the infected soldier as he finds him, that he has succeeded in perfecting a test for the presence of bilharzia in the body on the lines of the complement-fixation reactions, which I have named the Fairley reaction, and which I have been fortunate enough to have him try on some of our advanced cases among the fellaheen in Kasr-el-Ainy, with very convincing results.

Fairley has been good enough to give me an account of his work up to May 1917, which will be published long before it sees the light in these pages, so I need make no apologies for including his conclusions in this place. He bases his facts on 40 cases admitted to hospital since September 23rd 1916. Investigation showed that all these cases bathed in various fresh-water pools in different parts of Egypt, at some time between the preceding months from April to July; and that in all the pools either Bullinus or Planorbis snails, or both, have been found.

THE STAGE OF INVASION BY BILHARZIA. In about 60 °/₀ of the cases recorded, Fairley found definite symptoms of infection, in from 4-8 weeks after possibility of contracting the disease by bathing in an infected pool. In the quiescent period he surmises that the tail-less cercariae, having passed through the skin into the subcutaneous tissues, are carried to the blood of the portal system where they develop and mature, and the female becomes fertilised. During this time of developmental and sexual activity in the portal system, toxins are liberated, which produce a variable picture, within generally six weeks of the initial infection. In about eight weeks from their entry into the body, certain of the trematodes make their way against the blood stream down to their favourite seats of selection in the rectal, intestinal, and vesical vessels; and, after having become definitely localised, deposit their own particular type of ova in the sub-mucous tissues.

Though there is a general similarity common to these signs of invasion, three more or less definite types of symptoms may be seen.

1. Prolonged pyrexia with urticaria. This was first described by Lawton and Kellaway at No. 14 Australian General Hospital as a pyrexia of over three weeks' duration, with great emaciation, definite enlargement of the liver, and perhaps of the spleen, a blotchy urticaria, and an eosinophile leucocytosis. Cough was invariably present and pain and tenderness over the gall-bladder; and, in a small proportion of cases, dysenteric symptoms with mucus in the stools. Lateral-spined ova were found in the stools from 2-3 months after the time of the original infection.

Fairley found that this series of symptoms occurred in both forms of bilharzial infection. Of seven cases of true haematobium who bathed in one particular pool near Serapeum in July 1916, within the next six weeks five were in hospital with high temperature, general body pains,

headache, rigors, sweating, but with no cough or abdominal pain. Urticaria appeared in from 4-10 days and lasted about 7 days. It was often very marked and was generally diagnosed as fish poisoning. These cases stayed under treatment for from 10 days to five weeks, then all returned to duty; but during the next two to three months they all returned with scalding micturition and later a haematuria with terminal-spined ova in the urine. No lateral-spined ova were found in any case; but in three, terminal spined ova were found in the stools. Of the two who had no premontitory signs both developed signs of a typical haematobium infection.

2. *Mild transient pyrexia with marked urticaria.* This group showed slight passing feverishness, with nausea or even vomiting and occasional diarrhoea, but urticaria was the most prominent symptom.

Sixteen soldiers swimming together in Rifle Range Canal, Tel-el-Kebir, in June 1916, all developed an urticarial eruption within six weeks. Several while in the water or shortly after getting out noted a skin itchiness of some minutes' duration. The later history showed that the urticaria came out quite suddenly with typical puffiness of the cheeks and face and spread, and lasted about seven days. With it were mild febrile symptoms also. In a few cases urticaria was the only symptom noted. Subsequently all returned to duty and, later, ten have certainly developed the infection, three pure Mansoni and the remaining seven a mixed Mansoni and haematobium. The rest have almost certainly developed the disease and represent the dangers to others of latent bilharzia and are, indeed, carriers.

In all these cases examined there was a marked eosinophilia of from 10—27 %. Only one case showed no later signs of infection and probably for some reason the worms died before any local deposit took place.

3. *Urticaria without other symptoms.* Sometimes urticaria and not necessarily on the face, may be the *only* sign of infection, and there may be recurrent attacks over a period of 4—5 weeks, coming on originally from 4—8 weeks after swimming in an infected pool.

4. *Absence of preliminary symptoms.* This sometimes occurs and may be due to the very small number of worms that develop in the portal system or depend upon the susceptibilities of the individual. In these cases the first signs are those of localised deposits, 3—6 months after a reliable history of possible infection.

DIFFERENCES IN SYMPTOMS ACCORDING TO THE TYPE OF INFECTION. It will be convenient here to consider the variations in symptoms in both haematobium and Mansoni types of the disease, though we are not for the moment specially considering the urinary infections, which will be fully dealt with in the succeeding section.

1. *Infection with Bilharzia haematobium. Incubation.* In 50 % of cases the first toxic symptom appeared within 2—8 weeks of bathing in an infected area. The localising urinary symptoms of scalding on micturition followed by terminal haematuria and the presence of terminal-spined ova in the urine, were noted from 3-5 months of swimming in an infected

pool. They have come on as early as two and as late as nine months from the last risk of infection. Investigation of the pool responsible for these cases has disclosed the presence of Bullinus snails and cercariae in the water; and in *pure* haematobium infections the absence of Planorbis and its infecting agent.

In 30 % of cases there was present an obscure fever with urticaria. In 20 % urticaria alone and in 10 % an obscure fever without urticaria. All these cases were soon well, returned to duty, and in from 1—4 months after their premonitory symptoms developed definite signs of urinary bilharzia. In 40 % of the cases recorded the onset of the urinary symptoms was the first sign of infection.

The local symptoms among Fairley's soldiers correspond very closely to those we have noted in very young boys of the fellaheen type and, at a later age, among school boys. The most common is a burning or scalding urethral pain on micturition; and this was found in 60 % of Fairley's cases. In the rest the sequence was deep-seated perineal pain, penile pain, pain in one or both loins, and then frequency of micturition with terminal haematuria after 1—4 weeks. From this time onwards the symptoms progressed until the typical clinical picture of well-established bilharzia of the urinary tract developed and persisted.

Of these symptoms *haematuria* is a most constant feature, at the end of the act and varying from a few drops to even 15.0 at a time. In these early cases it is only rarely that macroscopic blood is found during the whole act of micturition. The bleeding may occur with every act or only once in 24 hours, or there may be an interval of some weeks. The blood is usually bright red but is sometimes dark and venous and may be passed in long worm-like clots. The haematuria is increased by exercise.

The *pain* is at first mild and may be perineal and deep-seated--at the neck of the bladder — or urethral and scalding, is sometimes referred to the tip of the penis, and generally is increased by making pressure over the supra-pubic region whilst palpating the abdomen. This supra-pubic pain is very common and is especially evident when the bladder is full or is pressed upon and is relieved by passing urine. The pain sometimes felt in the loins is low down and evidently referred from the urethra or bladder and is not renal in origin.

There is almost always some *frequency of micturition* at some stage, but this varies and usually lasts from 4—5 weeks. There may be nocturnal frequency but others pass urine hourly during the day. It is particularly persistent if associated with gonorrhoea. Usually an increased urgency is present or even inability to control the urine, leading to the involuntary passage of the last few drops of blood-stained urine.

In these urinary cases there is not any history of *dysentery*, but 50 % noticed the passage of blood and slime from the rectum.

The *general condition* of the patient is not affected, except for a loss of weight even up to a stone, and there is no anaemia; and both chest and abdomen are clear, except for the supra-pubic tenderness, and neither liver nor spleen is affected.

On *rectal* examination there is constantly felt a tenderness of the prostate. Fourteen days after the development of *vesical* symptoms, and five months from the initial infection, clusters of white elevated submucous nodules on the trigone may be seen with the cystoscope and a whitish fluid discharging from them, presumably ova.

The *urine* on standing deposits some mucus and phosphates, but it is always acid, with a S.G. of 1020 and contains a slight cloud of albumen. Microscopically, crystals of calcium oxalate are often seen and always pus cells and red blood cells, and terminal-spined ova, especially in the last few c.c.

Terminal-spined ova were found in the *faeces* in 40 % and the most favourable stool in which to find them is of solid consistency, perhaps streaked with blood but much more commonly covered with mucus.

The examination of the *blood* showed an average leucocytes of 11,020; and a differential count of 500 cells gave percentages of polymorphs 45.2, eosinophiles 14.9, small leucocytes 25.2, large mononuclears 13.6, and basiphiles 1. The average of red cells was 4,660,000 with occasionally some degree of secondary anaemia with poikilocytosis and an occasional nucleated red cell.

Percentage haemoglobin was 88 and colour index 65.

2. Mixed infections. Eleven cases of mixed infection were noticed and *toxic symptoms* were present in 55 %. In 10 % there was long-continued fever and urticaria. In 45 % urticaria alone or with very mild toxic symptoms; and in the remaining 45 % there were no premonitory symptoms.

The *localising symptoms* were variable. In nine out of the eleven, urinary symptoms were noted and in six of the eleven rectal symptoms. In several cases the stools had terminal as well as lateral-spined ova. In three cases the urine had both terminal and lateral-spined ova, but in all cases terminal spined ova were found in the urine and lateral in the stools.

The *general condition* of the patients was good though sometimes there was a loss of weight. The blood showed an average of 11,900 leucocytes and a differential percentage of polymorphs 51.03, eosinophiles 14.71, small lymphocytes 22.87, large mononuclears 10.53, basiphiles 8; with 4,760,000 red blood cells and haemoglobin 94 %.

3. Infection with Bilharzia Mansoni. The invasion symptoms are as described by Lawton and Kellaway in an earlier paragraph; and Fairley reports nine such cases treated in hospital, with acute febrile disturbance, rigors and sometimes vomiting, 4-10 weeks after swimming in an infected pool. There was sometimes diarrhoea and dysenteric symptoms, with the passage of blood and mucus at a later stage after the fever and gone. Cough was always present and abdominal pain, with epigastric tenderness or a tender gall bladder, and an enlarged liver and spleen. Urticaria was constant and there was always considerable loss of weight.

The blood showed over 20,000 leucocytes in all cases examined and differential percentages of polymorphs 13.6, eosinophiles 60.5, small lymphocytes 19.1, large mononuclears 6.3, and basiphiles 0.5.

Lateral-spined ova were found in the faeces in all cases in from 2½-4 months after infection.

The localising symptoms follow directly on the toxic for as these subside the cases pass into a state of chronic bilharzial dysentery, with tenesmus and the passage of blood and mucus. Between the attacks of dysentery there is rectal discomfort and the stools are generally solid and covered thickly with mucus. In such motions ova are most easily found There may be colicy and crampy pains in the abdomen but no indigestion, and a tenderness over the colon which may be quite localised.

Eosinophilia was still present, between 20 and 30 %. In all these cases the loss of weight is usually severe and repeated attacks of dysentery prevent much early improvement. Certain cases had lateral-spined ova in the stools but without symptoms. These were infected at the same time but 55 % had no premonitory signs, 45 % had urticaria and slight toxaemia, and 10 % had some fever only. These cases had only very occasional dysenteric attacks but were in much better condition than the others.

Nothing was felt by *rectum* in these early infections.

We must now endeavour to trace the further course of the disease as we meet it among our Egyptian patients.

THE EARLIEST EVIDENCE OF BILHARZIAL INFECTION of the rectal mucous membrane, as seen by the sigmoidoscope, is the presence of small dull-red coarsely granular patches scattered throughout the paler mucous membrane. In time these granulations increase in size and become the foundations of papillomata. Or a larger area of the membrane becomes infiltrated and raised areas of disease with similar characteristics are the main features of the bilharzial infection. A much more general infiltration of the whole thickness of the mucous lining may appear somewhat later ; and this condition in the rectum soon leads to great redundancy of the mucous membrane and even prolapse, at first only with defaecation and later to almost a permanent protrusion. Growing to this infiltrated membrane, occurring separately on a small base of infiltration, papillomata develop and usually become very prolific and remain one of the most common manifestations of severe bilharziosis of the rectum. Individual papillomata may become protruded from the anus, or large masses depending from a thickened infiltrated mucous membrane are very easily ejected from the rectum on very slight straining.

Rectal examination with the finger reveals the presence of commencing papillomata and, when extensive, the diffuse softened infiltrated membrane, which may be so soft redundant and separable from its muscular coats that it can be pulled down in folds or even prolapsed from the anus. Usually these incipient papillomata can be felt for some distance up the rectal canal ; and as they become larger and firmer they may be hooked down by their pedicles and made to present at the anal orifice. At first the sphincter muscle retains its tone ; but as the disease increases the anus becomes weaker and more and more patulous until the passage of soft or liquid faeces becomes to a considerable extent involuntary. Some control is, however, always maintained even in the worst cases with a permanent prolapse.

The *papillomata* can be seen either through the sigmoidoscope or actually exposed and show the characteristic dull-red granular appearance with often a good deal of erosion of its friable surface. The older growths are brownish yellow in colour and the membrane around their bases also shares in this same wet-seasand change, so characteristic of bilharzial infiltration. Such appearances are due in part to the calcification of innumerable ova and to the degeneration their crowding gives rise to in the infiltrated membrane.

Occasionally much more *sessile masses* are seen and in these ulceration may occur, though the main factor in the formation of ulceration, throughout the whole intestinal tract infected with bilharzia, is the circular sloughing round the neck of the papilloma leading to the separation of the main mass as a slough. This multiple sloughing leads to the persistence of the symptoms of bilharzial dysentery and it is difficult to see why, in an agricultural patient particularly prone to repeated re-infections, such ulcers should ever heal.

The *diagnosis* of the above-mentioned manifestations of bilharzia of the rectum is made almost as a matter of course, among the badly infected patients with whom we are brought into contact; but even when a differential diagnosis has to be faced, as for instance in quite a young person who has only recently been infected, the characteristic features just described must be recalled; and particularly the dull-red colour, the velvety friable surface of the mucous membrane, the soft granular surface of the papillomata and the absence of healthy mucous membrane over them, the wet-seasand appearance, both of membrane and growth, and the diffuse granular redundant mucous membrane with its complete alteration in the look and texture of its substance. The presence also of much thick mucus, from the hyperaemia and hypertrophy of the mucous glands in the membrane, is valuable evidence also. Finally, the existence of signs common to dysentery, of many types, obliges us to make a microscopical examination of the faeces or, more hopefully, of the blood-stained mucus, in which lateral-spined ova will usually be found without much difficulty, thus confirming the diagnosis.

The diagnosis from *piles*, either external or internal, presents no difficulty, as the piles are distinctly fleshy and firm, covered by skin or unaltered mucous membrane, and are situated essentially only round the anus or quite the lower end of the rectum. Inflamed piles have a very typical appearance of their own. On the other hand a bilharzial papilloma is much more pendulous on its neck, has a dull-red, not a blue, surface, is soft, friable and granular, and usually is one of a multitude of papillomata extending far up beyond the pile-bearing area, which is practically the lowest inch of the rectum. Simple *prolapse* also discloses a more or less healthy mucous membrane different in many ways from the soft granular redundant masses produced by bilharzial infiltration. True *dysenteric ulcers* do not often appear right down in the rectum and those in the lower sigmoid, as seen through a sigmoidoscope, with their ragged sloughs and acute well-recognised appearances, do not often lead to a mistake in diagnosis. The presence, too, of ova in the faeces or of scattered papillomata, still intact and non-ulcerated, and the absence of amoeba are points to remember; though Ferguson thinks that certain cases of bilharzial ulceration may also harbour amoeba or be complicated with amoebic dysentery ulceration.

Here in Egypt we have rather first of all to exclude Bilharzia before thinking of any other condition in this region; and are sometimes rather apt to forget that other disorders may occur with, or in spite of, the omnipresent bilharzia.

Beyond the *signs* we have incidentally mentioned, the patient with bilharzia of the rectum experiences much tenesmus and irritation around the anus and in the rectum in the early stages, and the passage of frequent motions of varying consistency, thickly coated with mucus and blood. The quantity of blood varies considerably and will depend entirely upon the stage to which the disease has progressed. At first, just as in the bladder with an infiltrated mucous membrane, the quantity may be quite small and only voided with defaecation ; whereas, with a marked prolapse, with or without papillomata upon it, blood may be almost constantly oozing away from the protruded area. The more general symptoms will depend entirely upon the condition of the rest of the gastro-intestinal tract ; and the papillomata or other manifestation in the rectum and the dejecta from the anus are simply indicators of the infected state at a much higher level. Lateral-spined ova are commonly found in pure infections ; but it must always be remembered that the Egyptian, the fellah particularly, is always exceedingly liable to multiple mixed infections, and both forms of ova may be passed in the rectum. If the eggs are there in the faeces, or rather in the dejecta from the rectum, bilharzial infection exists in some part of the intestinal tract, and means must be employed to localise the seat of the lesion. In the case of the rectum the finger gives valuable information, but the rectal speculum and especially the sigmoidoscope are the most important diagnostic weapons we have. The passage of a lot of thick glairy mucus, clean or blood-stained, especially after the patient has apparently completely emptied his rectum, is very suggestive and should lead to an immediate local and microscopical examination.

The *treatment* of these varieties of rectal bilharziosis is purely palliative and has already been sufficiently detailed in the section on intestinal bilharziosis. Any radical treatment by excision is largely prevented by the extreme softening of the infiltrated mucous membrane.

The other common form of rectal bilharziosis results in the *formation of fistulae* at the lower end of the rectum and often extending for considerable distances through the surrounding subcutaneous tissues. These arise from bilharzial ulceration within the rectal wall, as already described, may sometimes originate in bilharzial deposits in the subcutaneous tissues, or may have their seat of origin in the urethra. The presence of multiple irregular fistulous tracks well out on to the buttocks, around the sacrum, or forward to the perinaeum or thighs, is very characteristic; and their treatment involves an extensive slitting up of all the complicated tracks and a single division of the external sphincter. If thoroughly done such cases do uncommonly well, but naturally tend to recur as the original disease still remains within the rectum.

The other manifestations of rectal bilharziosis have been already described in the preceding intestinal bilharziosis sections, to which reference must be made to obtain the connected story of the extensive ravages of the bilharzia Mansoni.

We have nothing particularly local to add to the established description of the common rectal conditions. Thus ISCHIO-RECTAL ABSCESS is frequent and often enormous; and requires very thorough evacuation and drainage, with division of the sphincter in all cases in which there is the least thinning of the wall of the rectum, as palpated with a finger within the canal and the other in the cavity of the abscess. In any case, a fistula is very likely to form subsequently.

All the varieties of NON-BILHARZIAL FISTULAE form in considerable numbers and require very free slitting up and excision; and, however extensive and multiple the tracks, the sphincter must never be divided in more than one place. Wherever this division is done the incision into the soft parts beyond the margin of the anus must be very free, so as to allow thorough drainage and a gradual healing of the wound from the rectal end. At the operation all the tracks are slit up and the walls cut away and scraped thoroughly and then firmly packed with gauze. These plugs are soaked out in a bath of cyllin or eusol in 48 hours time, the wounds irrigated with eusol and then eusol-soaked gauze packed very lightly into them; to be soaked out and renewed each day till healing is well forward. Some have eusol to the end and others go through the various stages of dressing of a healing wound in any other situation.

Similarly, FISSURE is treated palliatively with liquorice powder at night and a small dose of sulphate of magnesia in the morning, the external application of 'pommade adreno-styptique' during the day, and the introduction of suppositories of the same formula at bed-time and after the action in the morning. Certain cases get well in this way; but in the vast majority operation is infinitely to be preferred. This may be done under local anaesthesia and consists in the free division of the sphincter right through the fissure; with the freer incision, into the buttocks or perinaeum or towards the coccyx, through the skin and soft parts, to allow proper drainage and a decent-sized wound, which can be seen and dressed and made to heal up from the bottom. The details of the after-treatment are the same as for fistula; but in very fat people any packing of the wound after the first may be quite impossible. Thorough cleanliness and baths in eusol twice a day soon make the wound heal without any trouble or pain.

PRURITUS ANI is not at all common and, after excluding and treating all possible general and local causes, our last resort, and one which is almost invariably successful, is the application all round the irritable part of hot air, in a special apparatus on the same principle as the blow-pipe with hot air the dentist employs to dry out a cavity he has prepared for filling. Ball's flap-raising operation is never done since the adoption of the hot air treatment.

PILES are very common and present all the usual characteristics and complications; and when an Egyptian considers it time to complain of his piles, it is usually very necessary to operate, whether it be on account of repeated haemorrhages, inflammation, and thrombosis, or of their enormous size. Ligature and Whitehead's operation are the two procedures adopted, though it must be admitted that it is comparatively rarely that a simple series of ligatures is sufficient to deal with the condition as we find it. In doing the usual extensive Whitehead's operation, care

is taken to fix the tube of separated gut by anchoring sutures at the cardinal points *to the exposed sphincter*, thus preventing the mucous membrane slipping back, and greatly facilitating its suture to the skin margin when the redundant parts are cut away. A tube wrapped round with a piece of gauze is inserted into the rectum after the operation and left in for 48 hours; and contributes considerably to the comfort of the patient by allowing the exit of flatus, and it also prevents any bleeding. In four days after the operation, an oil enema is given — 100.0 of warm olive oil — at the same time as castor oil by mouth, and usually there is not much pain with the first motion. No case of pile operation heals entirely by first intention, in our experience, and one can never judge of the result of this operation for at least three months after. Small tags may require removal with cocaine; tiny fissures may need the application of pure carbolic; a partial constriction, very often largely due to muscular spasm, may require the introduction of a well-greased and gloved finger — which may have to be repeated — and, only in very rare cases indeed, is any other operation for stricture after operation required. In spite of the bugbear of possible stricture afterwards, the dissection must be carried well up beyond the pile-bearing area of the mucous membrane and a good piece of the redundant skin, beyond the margin of mucous membrane, removed below. With a well-dilated sphincter and a clean and free exposure of the skin and mucous membrane, with under-cutting if necessary all round, so as to allow the margins to be sutured everywhere without tension, one need not be afraid of complications in this respect.

PROLAPSE OF THE RECTUM, though not common in *children* as in Europe, frequently occurs here in adults without any association with bilharzia. All degrees of the condition are met with, and, as a rule, readily yield to treatment by operation. When only a ring of mucous membrane is protruded, an extensive Whitehead's operation proves very satisfactory; but, in the more advanced cases, this must be supplemented by a deep semi-circular incision through the skin and subcutaneous tissues between the posterior margin of the anus and the coccyx. This incision is deepened well up into the curve of the sacrum, only stopping short of the peritoneal reflection in severe cases, and forwards till a large area of the posterior wall of the rectum is exposed. As large a hole as can be safely excavated is made, packed tight with gauze and allowed slowly to heal up from its depths. It is presumed that the contraction of the scar draws up the posterior and lateral wall of the rectum and so prevents further prolapse. This operation is often enough of itself, without any removal of mucous membrane; but the more advanced the case the freer must be this removal and, within certain limits of safety, the longer and deeper the posterior incision. Only in very rare instances is it necessary to do any more radical operation for prolapse, either by excision of a portion of the whole thickness of the prolapsed rectum, or a ventral fixation of the lower part of the sigmoid to the anterior wall of the abdomen, or to the posterior or lateral surfaces of the iliac fossa.

It would seem hardly necessary to remind oneself that a prolapse of the rectum may be entirely secondary to an obstructive or irritative

condition of the bladder or urethra; but in Egypt, with its national affliction of bilharzia in all grades of severity in the urinary tract, and its associations with stone, concretions and prostatic infiltration, the possibility of all such causal conditions must never be forgotten and carefully treated, as well as the prolapse they produce.

STRICTURE OF THE RECTUM is very rare, the only cases I have seen were in women with an old syphilitic history, or after a grossly careless operation for piles.

TUMOURS OF THE RECTUM other than bilharzial are very uncommon indeed and the same remark applies to malignant tumours. With the exception of epithelioma at the anus and lower end of the rectum implanted on an old bilharzial or other form of ulceration, we have no experience of surgical procedures for malignant excisions for rectal cancer, so seldom do we meet with the true cancer of the rectum and lower sigmoid. It is not that they do not very occasionally occur, but by the time they reach us they are quite beyond any operative measures.

XXVIII. THE SURGERY OF THE GENITO-URINARY TRACT.

In Egypt almost the entire field of genito-urinary surgery is dominated by the multiform manifestations of bilharzial infection; to such an extent that we have generally to assume that BILHARZIOSIS exists until we have proved to the contrary. So universal and commonplace is this disease that it is not easy to obtain trustworthy evidence, especially from the fellaheen, of its diffusion throughout Egypt, as in many instances it is looked on as part of one's natural existence and not worth mentioning.

Reliable statistics of any disease are notoriously difficult to obtain in Egypt, owing to the ignorance and suspicion of the mass of the people, and their deep-rooted objection to having their names or affairs set down and perpetuated in any paper or book that may form part of the Government archives ; and there is a further difficulty with bilharziosis, in that both the (Egyptian) medical man and the patient, or his friends, may not think it worth while mentioning the existence of such an ordinary everyday condition as this, in addition to any other disease the patient may wish treated, or which may have been the cause of death. It is possible, too, though difficult to prove — owing to a peculiar reticence on this subject — that, as in certain parts of the Transvaal (Brock), haematuria is looked upon as a sign of manhood and without which the begetting of children is impossible. This belief appears to be prevalent to a considerable extent in Egypt, particularly among young men, and not infrequently leads to a concealment of the fact of infection with bilharzia.

Whether from this reason or from ignorance of its effects, there is no doubt that, among all classes of the people, many cases of bilharziosis go entirely untreated, and so the risk of infection to others is enormously increased. In this connection I may mention that at the present moment I am attending a pupil of one of the public schools in Cairo with very severe bilharziosis of the bladder, and he was frankly amused when I reminded him of his possibilities of infecting others and suggested his taking certain precautions to prevent this happening. He told me that the disease was so common among his fellow students that any isolated attempt on his part to take precautions would not only be quite futile,but would also undoubtedly subject him to the ridicule of his fellow sufferers.

Sometimes, also, the disease may exist in such an early stage as to give rise to no symptoms. Some years ago may former colleague, Mr. Frank Milton, found that of 100 consecutive admissions to hospital, irrespective of their disease, 35 had bilharzia ova in the urine, and only 2 of this number complained of symptoms of bilharziosis; and in a school near Cairo Kautzky found eggs in the urine of 79 per cent of boys out of 124 examined, although all professed themselves to be in perfect health.

The publication of the annual reports of Kasr-el-Ainy Hospital, by Dr. H.B. Day, then Medical Registrar, gives me the opportunity of arriving at a fairly accurate estimate of the frequency of the disease among in-patients ; but these figures do not include the larger number of patients with bilharzia ova in their urine or suffering from painless

haematuria. They really only comprise those in whom the symptoms have become so urgent as to compel them to seek hospital treatment and then only because increasing gravity of their symptoms entirely prevents them from carrying on their everyday work. The Egyptian fellah—to use an appropriate colloquialism — will go on till he drops ; and, when at last he does give in, his condition is such as to almost absolutely preclude the possibility of any relief being afforded him, either by medical or surgical measures. The prognosis in such cases can well be imagined, and only the very mildest operation is required to upset the condition of unstable equilibrium on which the whole urinary tract has been balancing for so long, and to hasten the fatal issue. Any such intervention, to relieve pain or other distressing symptoms, usually means an opening of the bladder or pelvis of the kidney, after which the introduction of sepsis from without is almost certain to occur, with rapidly fatal consequences.

I have added to Dr. Day's figures a certain fair proportion of patients classified under other heads, such as renal colic, vesical calculi, hydronephrosis, pyonephrosis etc, conditions we know from experience to be in the main bilharzial in origin or certainly associated with the presence of bilharziosis in the bladder.

I have studied the figures for three years 1907—9 inclusive, and find that in 1907 the total number of admissions for medical and surgical diseases was 3,400, and of this number 336, and probably more, had bilharziosis ; in 1908 the admissions were 4,003 with 465 of bilharziosis ; in 1909 the admissions numbered 4,295, of which 469 had bilharziosis ; making a total of 11,698 admissions, of which 1, 270 had bilharziosis—that is to say, a proportion of 10 %. Males predominated in the proportion of 93.2 per cent as against 6.8 per cent females — a fact to which I have drawn attention elsewhere. It is probable, however, that there are more untreated cases among females than males (Elgood).

These figures do not touch the large number of bilharzia patients treated as out-patients, who are quite impossible to trace ; so that the only real conclusion we can draw from them is that in the largest hospital in Egypt ten per cent of the total number of admissions for medical and surgical diseases are suffering from the last stages of pathological destruction of kidneys, ureters, bladder, urethra, and rectum, produced by severe and repeated bilharzial infections. At least another thirty per cent are infected in varying degree, but are not absolutely prevented from working or are only temporarily disabled. Looss found that 35.5 % of boys in a Cairo school had haematuria, and 80 % of the boys in the outskirts of the same town. It is probable that a far larger proportion of cases would be found among the agricultural labourers, from which class the majority of our patients are recruited.

The *mortality* from bilharziosis *per se*, or its immediate complications, was just over 10 per cent ; but this hardly gives one even an approximate idea of the real mortality, as many cases, when they do not appear to be improving, are taken out of hospital to die at home, the native population here as elsewhere having a strong prejudice against dying in hospital. All such cases are entered as unrelieved, but had they been left in hospital many of them would certainly soon have been included in the mortality tables.

The cause of the severity of the symptoms and the resulting mortality is the *repeated reinfection* to which the fellaheen are particularly liable. A single infection may be, and often is, entirely recovered from, especially in females (Elgood), but it is difficult to see how such a happy result can be expected in the agricultural labourer, whose very work and habits render him all too liable to a long series of infections. It is not uncommon to find very old bilharzial lesions in bladder and rectum, and at the same time quite young worms in the portal vein, with intermediate stages in the chronological sequence of bilharzial pathological changes scattered throughout various parts of the body.

Post-mortem records afford rather a striking confirmation of the figures just quoted. Dr A.R. Ferguson, Professor of Pathology in the Medical School and Pathologist to the hospital, tells me that in a careful record of a series of 500 autopsies on male subjects between 5 and 60 years of age, he found that 8 % of all cases die of the effects of severe bilharzial infection. He cannot give exact figures of the number of cases in which bilharzia worms were found in the portal vein or its nearest tributaries, but they certainly are present in a very large proportion of autopsies of all natures, and that too without being necessarily associated with any very obvious bilharzial manifestations. So convinced is he, that bilharziosis is really the scourge I would have you believe, that, from his experience in the *post-mortem* room, he would venture to affirm that about one-half of the agricultural population of Egypt are shedding their blood and bilharzia ova, in urine and faeces, daily into the fields, a very serious drain on themselves and a constant menace to their neighbours as a source of infection and reinfection.

A study of the hospital records for 1912 shows that both the actual number of cases and the proportion to total admissions keeps up. There were 557 admissions for bilharziosis of various kinds out of 4555 admissions for medical and surgical diseases, a proportion of rather over 8 % ; but it is evident that with the increased strain on our beds only the more serious cases of bilharziosis were admitted, as the mortality was nearly 25 per cent. Similarly in 1913, though the numbers were relatively less, there were 397 cases of bilharziosis out of 4616 medical and surgical cases, a proportion of 11 per cent, with a mortality of 12 per cent.

Lecturing in 1912 before the Glasgow Medico-Chirurgical Society, Ferguson reports that he had been able to demonstrate by special methods the presence of ova, recent or calcified, in the tissue of 61 per cent of 600 male subjects, aged from 5 to 65, which came consecutively for post-mortem examination.

A historical summary of the events leading up to the discovery of the bilharzia worm will be found in the section on bilharziosis of the gastro-intestinal tract ; and there also the anatomy and life-history of the parasite is sufficiently set forth, for purposes of our surgical and pathological review of the effects of bilharzial infection. The fascinating investigations of Leiper which elucidated the mystery of the missing intermediate host are also described and, later, in the section on diseases of the rectum, the more recent work of Fairley on the last of the missing links, and the evidence of invasion of the body and the first signs of definite local infections by both varieties of the worm, must be again consulted to complete the cycle of Egypt's most dangerous modern plague.

PLATE 52.

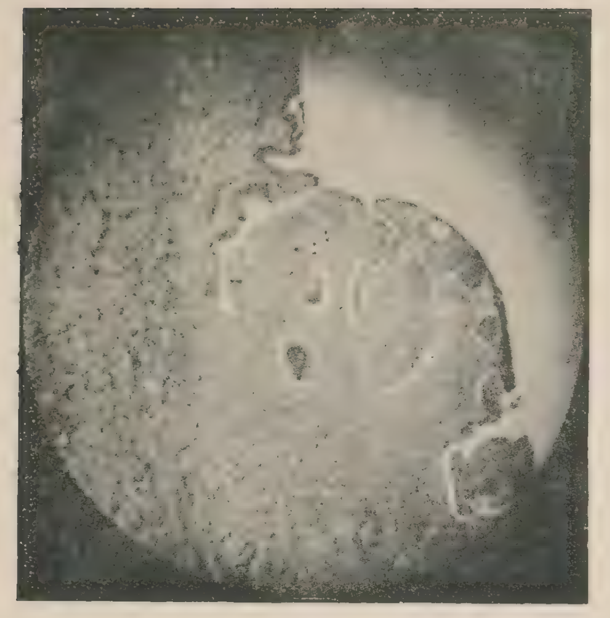


Fig. 1.

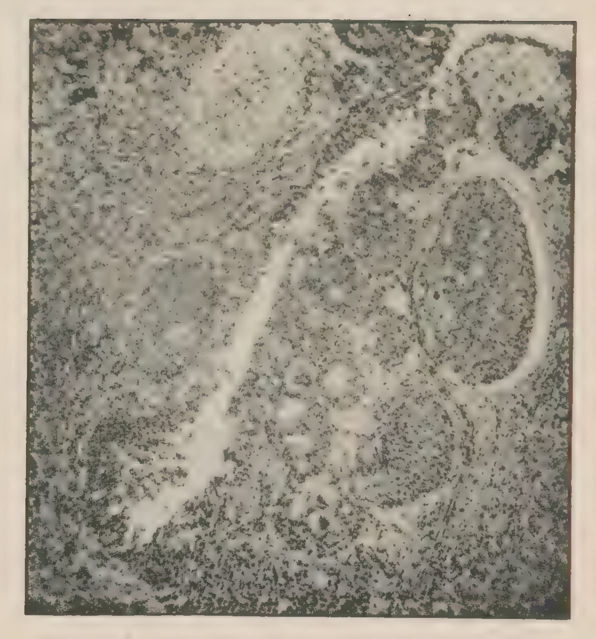


Fig 2.—Microphotograph of an epithelial tube in an infiltrated mucous membrane, due rather to the dipping down of certain parts of the thickened epithelium.

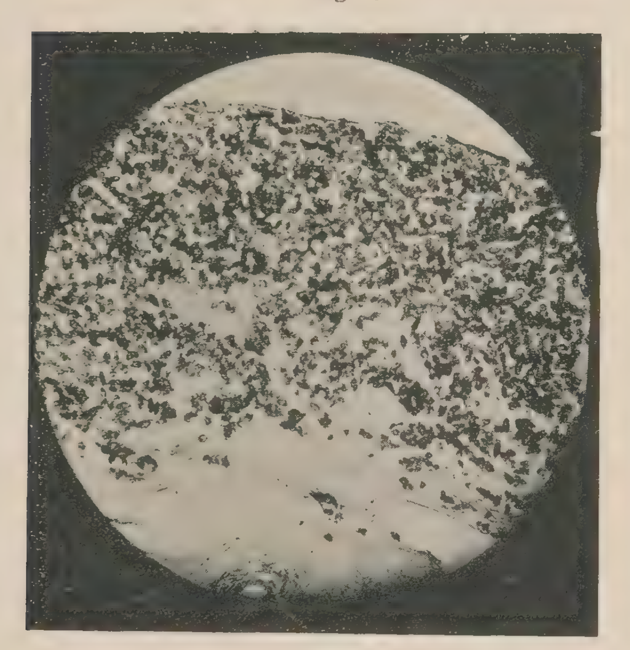


Fig 3.



Fig. 4.— An enlargement of a microphotograph of bilharzial papilloma of bladder, showing the dense packing of the submucous tissue with ova. Some are seen streaming up one of the fine processes of the papilloma and others making their way out through the epithelial lining. Others are lying in mucus after having passed through the epithelium. Preparation by Prof. Symmers.



Fig. 5.—Microphotograph of a section of bilharzial tissue, showing several couples of worms cut in situ. In one instance the female has been so much coiled within the gynecophoric canal that three sections of the body have been made. Preparation: Prof. Looss.

Fig. 1.—Microphotograph of a tiny bilharzial papilloma of the bladder. The thickened epithelial cap is well seen and the tubes of epithelium dipping down into the sub-mucous tissue. A few ova are seen as small black dots near the surface. The very fine small-celled infiltration deep to the epithelium is well seen also.

Fig. 3.—Microphotograph of mucous membrane of a bilharzial bladder consisting almost entirely of a mass of calcified ova. Figures 1, 2 and 3 are from preparations by Prof. A. R. Ferguson.

The *general* appearances of the pathological effects of bilharzial infection are described in the intestinal section; and we must now endeavour to detail the changes actually seen in the different parts of the *genito-urinary tract.*

BILHARZIOSIS OF THE BLADDER. It is in the bladder that the manifestations of this infection are seen at their worst; but it must always be remembered that similar if less marked lesions are being formed at the same time at many other points in the genito-urinary tract. It will be convenient to examine the different organs individually, but it is not possible to give the precise date of the appearance of the various stages of disease in the respective viscera.

The stage of *invasion* and the *earliest symptoms* of the deposit of the ova of bilharzia haematobium in the bladder must be studied again in the section on diseases of the rectum; and though these observations refer essentially to very early infections in the virgin soil of soldiers only temporarily resident in Egypt, the same symptoms occur in rather a more pronounced form among our earlier cases, more especially in young boys and the rather older infected school-boy.

The first evidence we usually have of the presence of bilharzia is *haematuria,* of a peculiar type, which will presently be described; but long before this occurs pathological changes have been going on, as a result of the constant irritation of the tissue by the ova, and when the first symptoms appear the disease is already of considerable chronicity.

As we have seen, the coupled worms find a lodgement particularly in the larger blood-vessels of the submucous tissue of the bladder. From this 'foyer' the eggs are laid in myriads into the finer vessels until these are literally stuffed with ova. Many of the ova leave the vessels within a short time of their deposit and are afterwards found lying free in the connective tissue. Both by *vis a tergo* of the accumulation of ova being laid behind and their own inherent mobility in the tissues, common to all foreign bodies, and the singular intuition that impels them towards a surface, from which they may escape into some appropriate medium, there to complete their life cycle, the battalions of ova move forward into the connective tissue and into the deeper layers of the epithelium cells of the mucous membrane: and we can see ova pushing out between the epithelial cells, which are still intact, or through a broken basement membrane, or streaming out into the cavity of the bladder, through tiny degenerated points or abrasions of the surface epithelium. At a rather later stage they issue from the depths and sides of the epithelial tubes which have grown down into the sub-epithelial connective tissue.

The number of ova diminish progressively from the mucous surface outwards through the cellular and muscular layers of the bladder wall. If the ova could be removed from the tissues, it would be seen that there is a multiplication of the epithelial cells, leading to a general thickening of the epithelial layer; and, beneath this, an irritative round-celled infiltration, which may degenerate, from the massing of ova in it, or may ultimately become transformed into fine fibrous tissue more and more developed as the numbers and irritation of the ova lessen. Extending to

this tissue, or even enveloped in it, coupled pairs of worms may be seen, with but few eggs in their vicinity. These, as soon as they are laid, make a bee-line through the tissues for the mucous surface, possibly helped by their spine and by the constant muscular contractions of the bladder. This infiltration of the inner coats of the bladder with cells and ova may be unevenly distributed and is especially common at the base of the viscus ; or it may involve almost the whole area of the mucous membrane, giving the appearance of a dull-red, soft velvety surface, which can be very easily abraded and bleed. This is especially liable to occur at the neck of the bladder during the effort required in the ejection of the last drops of urine and so arises the early *terminal haematuria.* Such a surface is, however, protected by a thin viscid mucus from an excessive secretion of the mucous glands. A very large number of the ova are calcified. Seen in and through the mucous membrane they appear as brownish yellow grains, and the whole effect is as if the deeper layers had been scattered throughout with *wet sea-sand.* This is a very characteristic appearance and is beautifully seen with the cystoscope. The mucous membrane may be so much swollen and thickened as to be thrown into large billowy folds and be easily stripped off the deeper layers.

Patches of *hyperaemia* and small extravasations of blood may be seen ; and, at quite an early stage, small rounded *nodules* may project from an infiltrated mucous membrane. These may become or appear as tiny cysts or vesicles and are very often surrounded by a radiating zone of dilated vessels. Or small elevations with definite pedicles appear, the first stage in the formation of *papillomata,* which, rather later, are very characteristic lesions. These early papillomata have a peculiar dark-red colour and a friable surface,and may occur in all sizes and shapes,scattered over the posterior wall of the bladder and quite commonly around the ureteral orifices. They occur singly or in groups on an infiltrated mucous membrane and may attain large proportions. On section they show a thickened epithelial covering,often full of ova, which also invade the fine connective tissue core of the pedicle which is directly continuous with the submucous tissue beyond. A varying degree of cell infiltration is present and in places the epithelial lining dips down into the sub-epithelial tissue and forms pockets, exactly similar to those seen in an infiltrated membrane when no papillomata are present. These characters are common also to the very diffuse masses of papillomata, which in more advanced cases dominate the whole aspect of extensive bilharzial disease of the bladder. Irregular hummocky elevations may somewhat later make their appearance and project into the cavity of the bladder. These are either broad-based, low-lying *callosities* of the epithelium, similar in structure to that of a flattened out papilloma, or nodular masses of firm bilharzial fibrous tissue deeper in the walls of the bladder and pushing before them an infiltrated mucous membrane.

In certain cases the mass of calcified ova in and beneath the surface dries up and the lining membrane presents an appearance not unlike *dry sun-baked sand,* while the deeper layers are much thickened and fibrous. These *sandy patches,* which grate under the knife, must not be mistaken for phosphatic concretions on an abraded or ulcerated mucous membrane, to which reference will be made later.

PLATE 53.

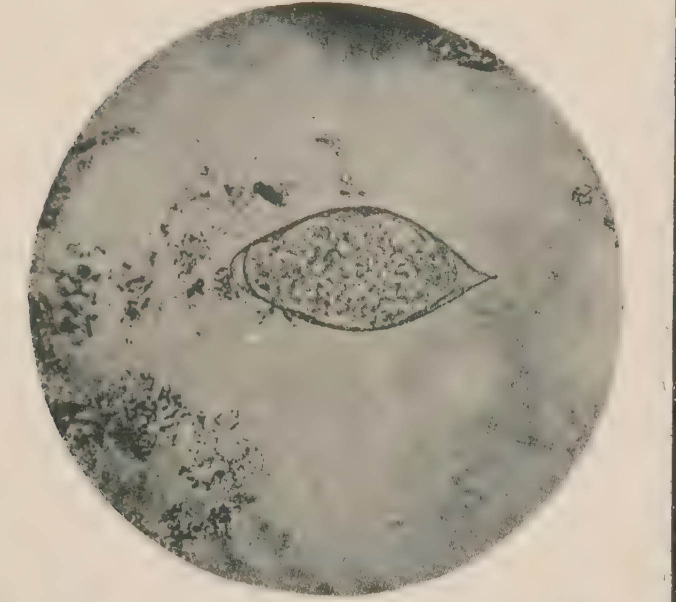


Fig. 1.—A terminal-spined ovum with clear but granular contents. Preparation by Dr. Bell in Manson's Tropical Diseases. Cassell.



Fig. 4.- A hard rigid bladder with dry sandy change throughout the mucous membrane and tissues beneath it. Path. Museum.



Fig. 2.—An early degree of bilharzia of the bladder with marked general infiltration of the mucous membrane and of the prostate; and considerable fibrous thickening of the walls of the bladder. Path. Museum.

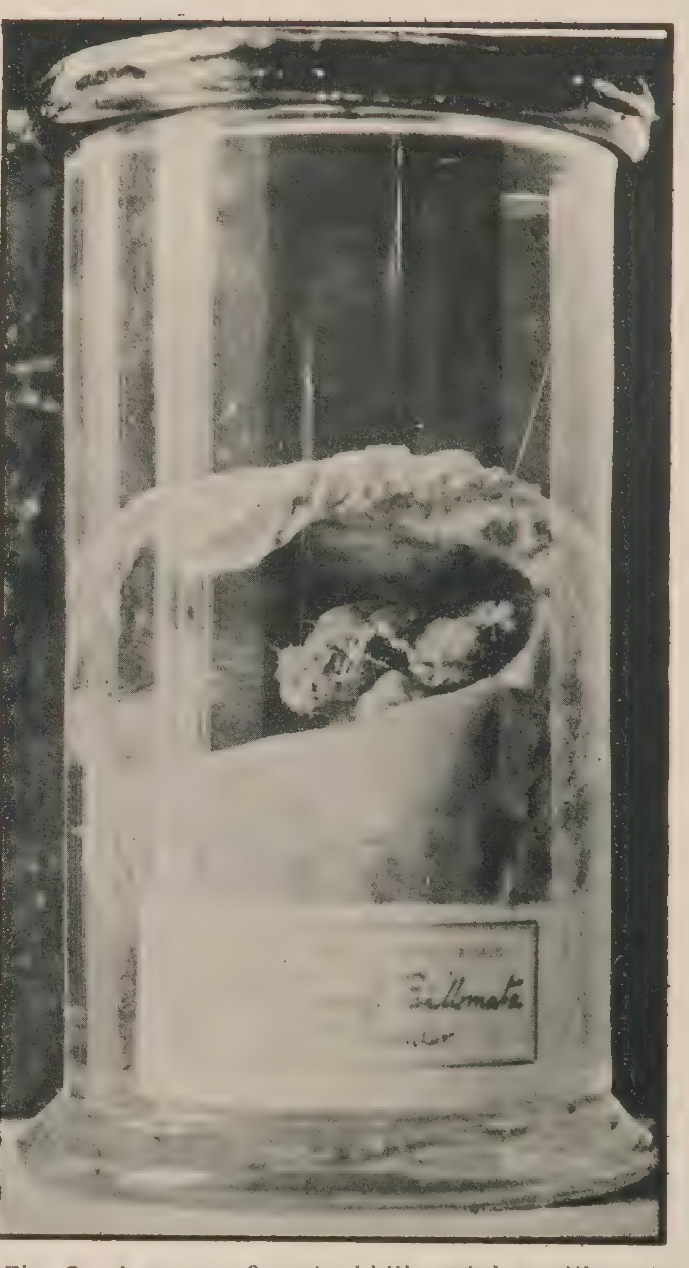


Fig. 3.—A group of typical bilharzial papillomata in a much thickened bladder. Path. Museum.

Papillomata may degenerate, leaving a raw pedicle, or abrasions of infiltrated membrane may occur and both become coated with phosphates when the urine turns alkaline, but ulceration *per se* is not a marked feature of bilharziosis of the bladder. The greater part of the mucous membrane, and the papillomata with which it is sown, may be seen by the cystoscope, universally yellow with crowds of calcified ova, to such an extent that the red reflex is entirely lost, and yet no sign of ulceration is present. Pieces of these calcified *phosphatic concretions* may break off, be interned in a pouch in some part of an irregular bilharzial bladder, and become the nucleus of quite *large phosphatic stones*, many of which also contain calcium carbonate. These phosphatic stones are common in the later stages of the disease, as is only to be expected as the urine is so constantly alkaline. The majority of *vesical calculi* in Egypt, however, consist of uric acid or calcium oxalate with thin alternating layers of phosphates, deposited during some temporary alkalinity. These stones are, of course, found in acid urine, the salts being probably deposited on a piece of ova-laden papilloma that has degenerated off. For this reason such stones will contain ova in their nucleus. It is conceivable also that masses of extruded ova may become glued together with mucus to form a nucleus, while lodged in some small pocket in the bladder, but the former suggestion seems more reasonable.

While these changes are progressing on the surface and just below it, *infiltration of the deeper layers* is proceeding at the same rate; and in what *appears* to be an early stage of the disease, the walls of the bladder are already thickened and fasciculated, at first by a general muscular hypertrophy and later from the development of fibrous tissue. Indeed, the walls may be so thoroughly infiltrated that the muscular tone of the bladder is almost entirely lost, and the viscus becomes ultimately a fibrous non-contractile bag. If the neck of the bladder is thus affected its sphincter action is annulled and incontinence of urine results. Or, again, the bladder becomes a mass of fibrous tissue with a much contracted cavity lined by ragged mucous membrane, remains of papillomata, sandy patches or phosphatic concretions, and sometimes tightly gripping a large phosphatic stone. In very chronic cases the constant passage of the multitudes of ova through the epithelium may result in epithelial proliferation to such an extent that a true cancerous condition results. This is '*the irritation cancer of Egypt*' (Ferguson), with metastic growths in glands and distant organs, especially the heart muscle. In 40 cases of this nature Ferguson found in 36 the growth was a flat-celled epithelioma, but in the remaining 6 the form of malignancy was sarcomatous. In extensive cases this *hard thickening* becomes very diffuse and involves all the structures of the anterior abdominal wall, from the umbilicus to the pubis and laterally to well out towards the iliac fossae, in one great hard mass which, on section, is seen to involve and almost replace the subcutaneous tissue, the recti and oblique muscles, and the connective tissue space all round the bladder, and is tunnelled by fine ragged fistulae, communicating with a much infected bilharzial bladder.

So important is this question of secondary cancer that I propose to include in this section a summary of an excellent investigation by my friend and colleague, Professor A. R. Ferguson, on 'Associated Bilharziosis

and primary malignant disease of the urinary bladder', which he published in the Journal of Pathology and Bacteriology, Vol. XVI. 1911, and which is the basis of our scientific knowledge of this complication of bilharzia.

Ferguson remarks that his experience in Cairo has impressed him with the fact that, in the male, malignant disease of the bladder is distinctly more common in Egypt than elsewhere. "I am driven, for reasons which will be detailed later, to associate this with the prolonged irritation of the epithelium lining the bladder, by the presence beneath it, and the passage through it, of the ova of bilharzia haematobium". He then gives the figures I have already quoted of the frequency of the disease among the fellaheen ; and points out that ova may be detected in many unsuspected viscera by digesting small portions of tissue for two hours or more in a 5 % solution of caustic soda. The softer parts of the tissue are disintegrated by the alkali and any ova, especially if calcified, fall as a fine granular sediment. After carefully decanting off the supernatant fluid the sedimented matter is examined in a Petri capsule with a low power (1 ½ in.). In fifty consecutive cases ova were found by this method in 38, or 76 per cent. "In simple cases of bilharziosis of the ureter and bladder it is the rule to find that the surface epithelium is considerably increased in thickness ; and that columns or cylinders of epithelium, continuous with that of the surface, pass some distance downwards among the connective tissue and other cells of the specific inflammatory new-formation." This shows the action of ova as an irritant and it is from this constant irritation, from the passage of enormous numbers of ova through the epithelium, in a frequently re-infected fellah, that this irritative cancer develops. This condition very rarely occurs in the intestinal forms of bilharziosis. Ferguson states that in three years work in the post-mortem room he only saw nine cases of malignant disease of the sigmoid, rectum and anus.

Of the forty cases on which the paper is based, in 21 the malignant growth had started in the posterior wall and only in three from the anterior wall. In 10 cases the whole bladder wall was equally infiltrated, and the bladder was converted into a rigid spherical mass. In practically every case the vesical cavity was extremely septic. (*Clinically* we find early cases, involving the anterior wall, occurring as hard roughened plaques let into the thickness of the wall, and presenting an irregular though not usually ulcerated surface into the bladder cavity. When on the posterior wall the case frequently comes to operation as a case of enlarged prostate ; but on supra-pubic exploration no prostate is present, only a hard raised mass, fairly well localised to the lower part of the trigone, but keeping free of the actual urethral opening). In 34 cases the growth was cancerous—generally flat-celled epithelioma—whilst in 6 it was sarcomatous. In 14 cases the retroperitoneal or iliac glands were involved; and microscopically found to be affected with the same structure as the primary growth, and in two there was metastasis in the glands of the groin. In no less than 5, tumour nodules were found in the heart. In two of these no other metastasis was found, and in the other three general dissemination had occurred. This occurrence of cardiac metastases has been confined to cases of primary malignant disease of the bladder. In cases of general dissemination the disease has always been found growing inside the vesical veins themselves.

PLATE 54.



Fig. 1.—A bladder completely filled with soft bilharzial tissue of cheesy consistence, probably sarcomatous in nature. The cavity of the bladder is seen as a semi-lunar chink in the lower left corner. Path. Museum.

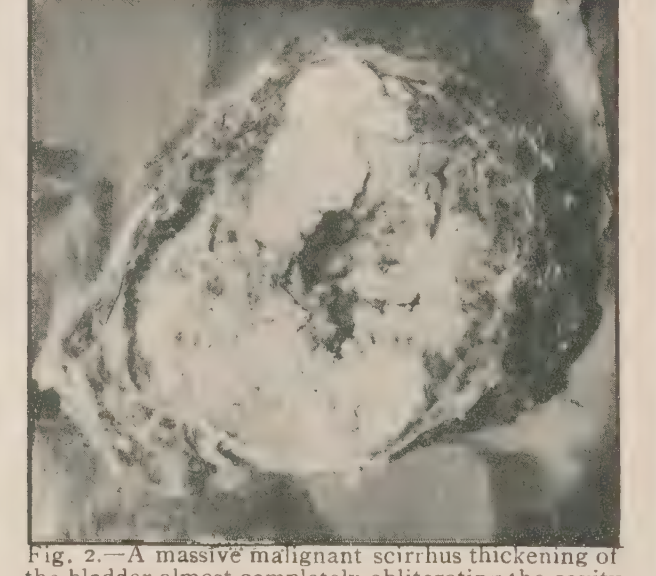


Fig. 2.—A massive malignant scirrhus thickening of the bladder almost completely obliterating the cavity of the viscus; and associated with great dilatation and thickening of the ureters. Path. Museum.



Fig. 3.—Microphotograph of a portion of the growth in the preceding figure showing ova in between masses of epithelial downgrowths. Preparation by Prof. W. St. Clair Symmers.



Fig. 4.—Malignant disease of the bladder afte bilharzia with secondary back-working effects on the ureters and kidneys. Path. Museum.

In all cases the bilharzial process had obviously existed for many years and probably no cases lived for longer than two years after the development of the cancer. Naturally once dissemination begins to occur almost every organ or tissue in the body may become affected.

The *symptoms* of these cancer cases are really those of very severe and generalised vesical bilharziosis; and with all the grave changes already produced in ureters, renal pelves, and kidneys, as well as in the bladder, the patient cannot be expected to live for any length of time, whether cancer develops or not.

Later changes in bilharzial bladders. At a later stage, when septic changes have run riot, masses of papillomata may be seen in large shaggy masses with a fleecy surface, growing in clusters from the wall of the bladder; or solid masses of soft caseous-like degenerated bilharzial tissue may almost fill the bladder cavity. Occasionally fistulae lined with bilharzial granulation tissue may appear in the suprapubic region, or at the umbilicus, or over the front of the abdomen, communicating with the bladder, either directly, or through the medium of a mass of soft degenerated tissue in the prae-vesical space. Rarely, an enormous proliferating mass may spontaneously burst through the infiltrated bladder walls into the peritoneal cavity; and I have seen one case in which an injury to the lower part of the abdomen had caused a wide transverse rupture of the bladder, along a line of massive papillomatous growths, with fatal consequences: and another in which a recto-vesical fistula developed.

STONE IN THE BLADDER IN EGYPT AND ITS RELATION TO BILHARZIOSIS.

It is a common fallacy that stones in Egypt only form in a bilharzial bladder at a late stage of the disease and when the urine has become permanently alkaline. This is certainly not the case, as the large majority of stones occur before any late septic changes have developed and are only very rarely indeed completely and primarily phosphatic. I have had the good fortune to have had a series of Egyptian calculi examined by Dr. G. S. Gordon of Vancouver, who is a recognised authority on the question of the analysis of stones and who prepared the plate and analyses of calculi for Kelly and Musser's work on Diseases of the Kidneys. He reports that almost without exception the nucleus of the stones is oxalate of calcium, in his opinion derived from the blood which comes from the lining of the bladder throughout almost the whole period of bilharzial infection. As still further proof of this idea he finds that the nuclei contain a small quantity of iron. He was unable to find a single example of a phosphatic nucleus or a purely phosphatic stone. This certainly coincides with our experience; as even the large white stones, soft and friable at times and at others as hard as marble from admixture with calcium carbonate, always have a brown or black centre, with alternating layers of uric acid, oxalates, or phosphates, indicating the stages of the varying reaction of the urine during the progress of the bilharzial disease within the bladder, and the waves of septic infection through which the urine has passed.

In a paper published in the Lancet of July 19th 1913 on 'The incidence of stone in Egypt, with remarks on a series of 312 operations', I point out that in my first 100 cases of operation for stone, published in the Inter-colonial Medical Journal of Australasia for July 20th 1902, it was observed that though 60 contained phosphates, among other constituents, there were only 10 purely phosphatic stones in the whole series. As a matter of fact, the majority of stones met with in Egypt have a nucleus of uric acid or oxalate of lime, and are originally begun in acid urine. Later, partly from their own irritative effects and partly from their occurrence in a bilharzial infected urinary tract, an alkaline condition of the urine occurs with the precipitation of phosphates, which become deposited on the original nucleus and lead to the rapid enlargement of the stone.

Some of the nuclei contain bilharzia ova (Looss and Ruffer) which were probably lying originally in a broken piece of bilharzial papilloma ; and in the early and milder degrees of bilharziosis, before any sepsis has been introduced either from within or from without, there is no reason why the urine should not remain acid and the resulting stone be entirely uric acid or oxalate, with perhaps thin layers of phosphates when the irritation it produces is sufficient to give rise to an alkaline urine. The stone will be purely phosphatic only when it has started as a phosphatic concretion on the surface of a bilharzial ulceration or abraded papilloma in any part of the infected urinary tract. In such cases the alkalinity of the urine is practically constant, and a soft white friable stone results. Sometimes a white hard marble-like stone, consisting largely of calcium carbonate, forms under similar conditions.

Apart from the role played by bilharzia as an originator of stone as just described, we can offer no fresh evidence to clear up the vexed question of the cause of the *formation of stone* in general. The whole country, almost without exception, drinks Nile water, and, though it is true that more cases come from Lower Egypt and the Delta than from Upper Egypt, this can hardly be ascribed to local variations in the water-supply, but rather to the increased frequency of bilharziosis in these districts. On the other hand, there is far more probability of the impregnation of the water with lime salts in the course of the river through Upper Egypt, than in the much cultivated agricultural land in the Delta.

The admissions for stone to Kasr-el-Ainy Hospital for the last five years are nearly constant, averaging 130 cases a year ; but the admissions for bilharziosis of the urinary system have increased year by year for the same period. Thus the incidence of stone and bilharzia are, to some extent, at least, independent of each other ; and though, in a country where 50 to 70 per cent of the whole native population show evidences of bilharzia, it is difficult to dissociate the two conditions, there must be still some other cause of stone, the true nature of which is at present undetermined. It will be interesting to note if, with the very much increased area of land now kept under perennial irrigation to the south of Cairo, bilharziosis, and with it stone, will increase in proportion during the next decade.

PLATE 55.

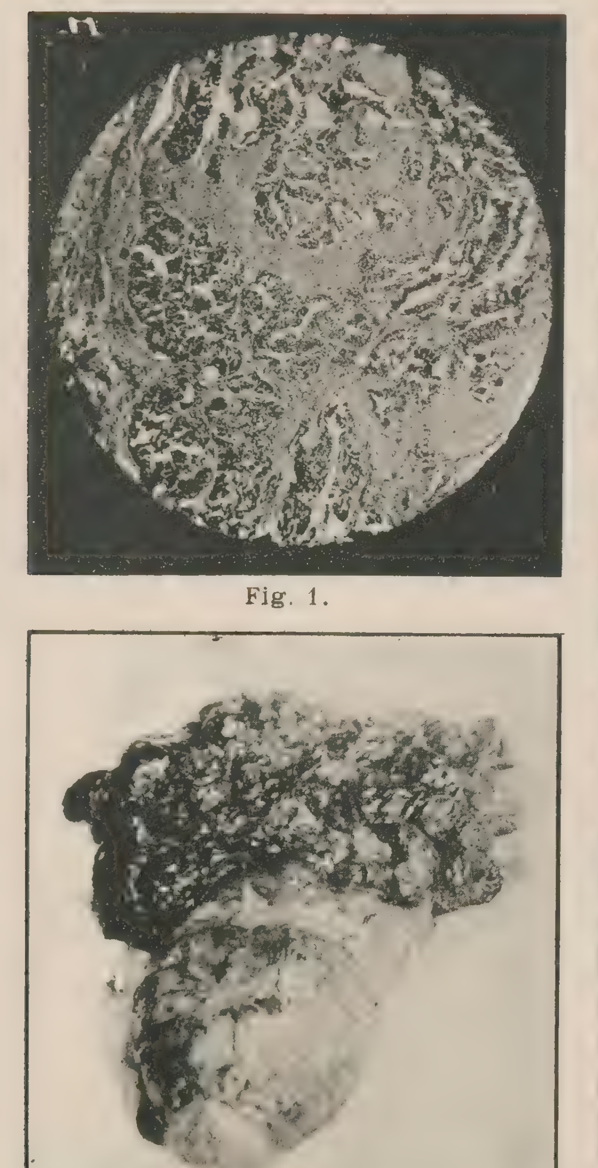


Fig. 1.



Fig. 2.



Fig. 3.



Fig. 4.

Fig. 5.

Fig. 1.—Microphotograph of scirrhus cancer of the bladder wall secondary to bilharziosis. Preparation by Prof. Ferguson. Fig. 2.—Enormous bilharzial papillomata formation which has burst through the bladder into the peritoneal cavity. Fig. 3. -A bilharzial ureter showing raised masses of typical appearance patchily distributed along the course of the tube. Path. Museum. Fig. 4.—A bilharzial ureter showing marked generalized infiltration, with its peculiar soft friable granular surface due to myriads of ova under the epithelial lining. Most of the ova are calcified and there is also a fine phosphatic deposit on the surface. Path. Museum. Fig. 5.—Bilharzial papillomata in the ureter. Path. Museum.

The vegetarian habits of the fellaheen, who are the most common victims of stone, probably contribute very largely to the formation of stone; and it is reasonable to suppose that the enormous meals taken often at very long intervals, overload an already chronically dilated stomach, and the subsequent digestion and absorption must be imperfect and so lead to the elimination in the urine of incomplete by-products in the urea metabolism and 'vegetable salts'. These salts occurring in excess in a very acid urine are ever ready to be deposited in the straight tubules or pelvis of the kidney, or in any other part of the urinary system, and become the foundations for a calculus.

All *sizes* of stone are met with in the bladder and at all stages of bilharzial progress; and, according to the condition of the bladder, they may be free or encysted. All the usual methods of *diagnosis* are practised, whether by sound, with or without palpation, either abdominal or rectal; by cystoscope; and, before a negative opinion is given, the bladder should always be filled with fluid and an attempt made to evacuate any tiny hidden stone by evacuating catheter and an evacuating syringe, as when clearing out the fragments after lithotrity. In vesical calculi it is comparatively seldom recourse has to be made to X-rays for diagnosis. Though the majority of stones are easily felt with the sound it may sometimes be quite difficult to do so in a badly fasiculated bladder, especially posteriorly, or when the various bilharzial changes have become at all advanced. It would, perhaps, appear hardly possible, but the presence of a stone in an already very badly irritable bladder, the result of bilharzia, very distinctly aggravates the local symptoms; and the sudden stoppage of the stream during the act of micturition is of very special significance of its presence. The symptoms give no indication of the size of the stone, a small rough knobby oxalate stone generally proving the most irritating of all, and infinitely more so than a large smooth-surfaced, round, or elliptical stone of quite considerable size.

Sometimes a comparatively small stone may almost completely fill and be held tight by a thick contracted bilharzial bladder and be impossible to remove by lithotrity, owing to the difficulty of introducing a sufficient quantity of fluid. Again, a stone may be closely *encysted* within a pouch in the bladder, generally in the posterior but sometimes in the anterior wall. Similar pouches may occur in the bladder wall but be empty of stone, which lies quite naturally in the main cavity of the bladder. In such cases lithotrity may prove dangerous as these pouches are often excessively thin-walled. *Multiple* stones are not very common, but Dr. Maloney, formerly Resident Medical Officer, reported a case of 122 stones, weighing in all 459 grammes, and I have had another case of 16 facetted stones removed at one time, after the extraction of an impacted stone from the urethra. Occasionally one finds stones of from 300 grammes and upwards which completely fill the bladder and have to be removed with hammer and chisel. Mr Richards has reported a case in which the fragments removed in this way by combined perineal suprapubic lithotomy weighed 32 oz. (907.0)

The *prognosis* of stone in the bladder can only be considered with the condition of the genito-urinary tract, in which it has found a lodgment. Seen in this light it will readily be understood that prognosis

depends upon the stage to which the bilharzial disease has progressed, and the extent and nature of the involvement of the ureters and kidneys. The operation that will do least to interfere with the existing infection, whether purely bilharzial or septic in addition, should always be adopted; and it is on this account that lithotrity remains the operation of choice for by far the majority of all stones in Egypt, the procedures of supra-pubic or perineal lithotomies, with their risk of introducing sepsis from without, being only used when special circumstances indicate their adoption.

Then again the outlook will depend on the degree of the obstructive effects caused by the stone itself or by another stone in other parts of the urinary tract. One has especially to think of hydronephrosis, produced by a bilharzial blocking of the lower end of the ureter and disease within it, or by a small stone impacted and gradually obstructing the outflow of urine from the renal pelvis or ureter. Such hydrone-phrotic swellings, occurring in either of these ways in a bilharzial-infected tract, almost always become septic and very soon pyonephroses. We must not, therefore, think of a stone, either from its presence or effects, apart from the bilharzial infection of the urinary tract in which it lives and has its being.

Apart from these considerations, the whole study of stone as regards its causation, formation, conditions, diagnosis and treatment must be pursued in general text-books ; but a few words are necessary to indicate *the formation of phosphatic stones* within a badly-infected bilharzial bladder.

The slow enlargement of a pre-existing stone by the deposit of layers of phosphates when the urine becomes alkaline, requires no further elucidation ; but in other cases encrustations of phosphates readily occur on the surface of ulcerations or on the tops of degenerating papillomata ; and though they do not form a true rounded stone they usually give rise to masses, lightly held together and forming balls of white or yellow urine-soaked crumbly material in the lower part of the bladder. Much of this calcified debris may be removed by an evacuating syringe and catheter, or in the course of a perineal or supra-pubic section. Tiny yellow masses of very sandy consistence are constantly seen by the cystoscope. These must become in many cases nuclei for subsequent stones or incrustations; and, being largely calcified ova and pieces of papillomata or infiltrated mucous membrane, form calculi in which ova may be found in their nuclei.

One also finds on cystoscopic examination very minute black particles, adhering like small flakes of coal to a roughly sandy bilharzial infiltration of mucous membrane. These are exactly similar to the microscopic appearances of a badly affected ureter, the blackish brown elevations in which, Ferguson has shown, consist of innumerable calcified ova, on which also there may be phosphatic deposits.

Finally the intensely hard polished white stone, as heavy and as hard as marble, due to a combination of calcium carbonate and phos-phates, must be noted.

PLATE 56.

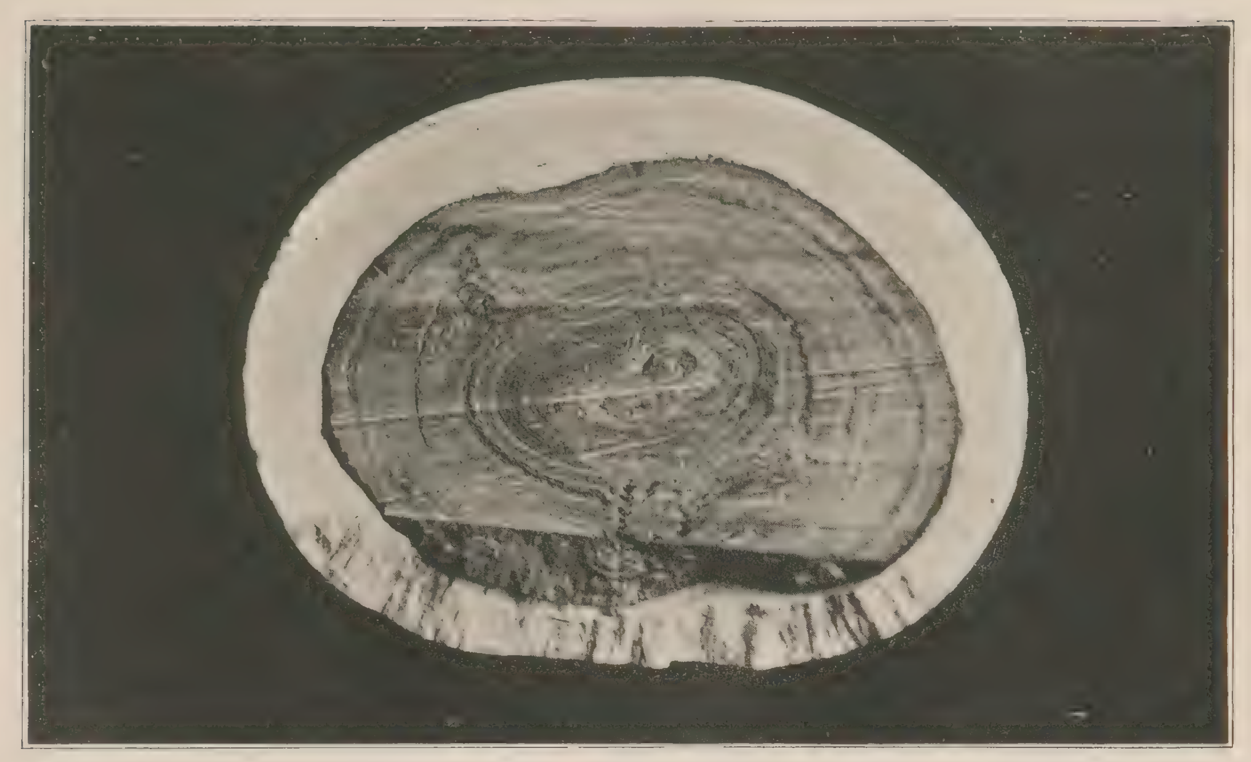


Fig. 1.—A stone weighing 240.0 removed by suprapubic lithotomy. The outer casing consists of phosphates and calcium carbonate and is hard and white like marble.

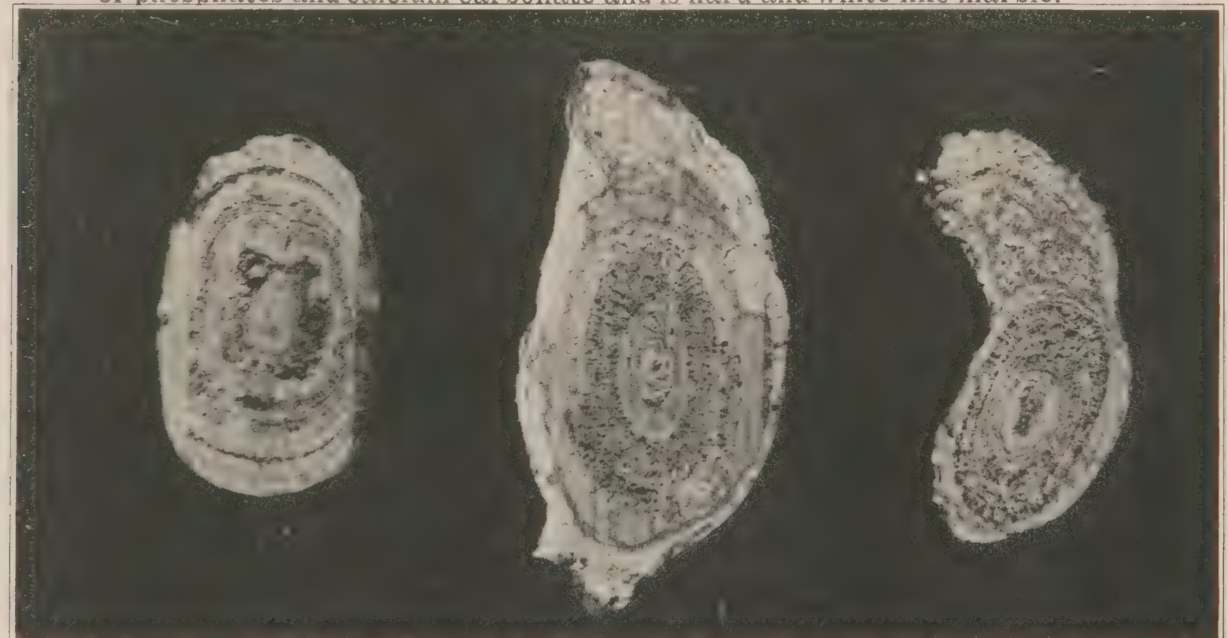


Fig. 2. Good examples of stones with alternating layers, the nucleus in all cases being oxalate or more rarely uric acid.



Fig. 3.—Similar calculi but with more phosphatic deposit, but in no single case is the nucleus composed of phosphates.

A series of Egyptian vesical calculi, cut in half to show their structure by Dr. G. S. Gordon of Vancouver, and photographed by F. King.

A smaller proportion of stones *do* occur in a bladder which is *not* affected with bilharzia, but the chances are very much against it, in view of the almost universal distribution of bilharzial infection. The treatment of such cases is the same as in the complicated cases, but the prognosis is infinitely better.

THE TREATMENT OF STONE. *Lithotrity* must always be the operation of choice for stone in the bladder here in Egypt; for not only is it the most satisfactory operation, but it holds out the greatest hope of a favourable result, inasmuch as it minimises the risks of possible further septic infection. Where the ureters and kidneys are so often and so badly affected, it is reasonable to suppose that many cases of recovery after lithotrity would likely have proved fatal if any cutting operation had been done.

Lithotrity, however, even in a comparatively healthy bladder, has its limitations. It is not a satisfactory operation in children. The preliminary stages can be quite well carried out; but the stone has to be crushed very small indeed to allow of its evacuation through the tiny catheter demanded by the calibre of the urethra; and several insertions of the catheter and lithotrite may be necessary before the operation is completed. The urethral mucous membrane is so soft that this repeated instrumentation may produce considerable damage to the canal, with the risk of subsequent constriction and even stricture. More than this a suprapubic lithotomy is so satisfactory in children and may be done without scruple, as one does not expect to find advanced bilharziosis at this age, and in most cases the incision in the bladder can be completely closed without drainage. Bad bilharzial affection of the urethra with destruction of portions of the mucous membrane and fistulae will sometimes prevent the possibility of lithotrity; but stricture of the urethra from any other cause need not necessarily be a bar to its adoption, if preliminary dilatation or urethrotomy be practised.

One is rarely deterred by the size or hardness of the stone from doing lithotrity; for, provided that the bladder can be adequately distended with fluid, crushing may be effected. When a thick bladder is tightly contracted down on a large stone no amount of hydraulic pressure will distend the bladder; nor must it be attempted, as there is very considerable risk of rupturing such a bladder, especially where its walls may have been thinned by the presence and pressure of the stone. Suprapubic lithotomy must be performed in such cases, a second drain being placed in the perinaeum if there is much posterior pouching of the bladder. Encysted stones are best treated in this way also, though I have on more than one occasion managed to insinuate the blades of the lithotrite into the neck of the pouch and have gradually crushed the stone *in situ*. But it is not good practice. When the urine is filthy and full of debris, and the bladder obviously intensely septic, a perineal section should be done and frequent irrigation carried out, in spite of any other risks; but in most cases this drainage is only the beginning of the end, as the case almost invariably comes to a fatal termination from septic kidneys, uraemic diarrhoea and exhaustion, with extreme emaciation.

I invariably use Milton's lithotrite, and cannot speak too highly of its simplicity and efficiency. One must always use a lithotrite as large as the urethra will carry and do as much as possible at one insertion. Then introduce a full-sized straight evacuating catheter with a large eye and evacuate the fragments slowly and carefully. Milton's evacuating syringe consists simply of a large rubber bulb, with two orifices placed at right angles to each other, one of which fits on the end of the evacuating catheter, the other grips the neck of a glass bulb into which the fragments fall. There are no valves or taps of any kind and as it is an instrument of considerable power care must be taken in its use.

During the course of lithotrity it is wise to palpate the lower part of the abdomen just above the pubes from time to time for subcutaneous emphysema, an infallible sign of a rupture of the bladder. This accident may occur from a false passage through the base of the bladder or elsewhere, by the improper passing of a sound, catheter, or lithotrite during the operation, and calls for an immediate suprapubic incision and exploration of the bladder, followed by appropriate treatment should any tearing really have occurred. To guard against this happening, the straight evacuating catheter must be very carefully passed and guided by a finger in the perinaeum, or even in the rectum in difficult cases, and the lithotrite must be allowed to fall into the bladder by its own weight, being guided along the bends of the urethra *en route*. If its beak cannot be freely rotated in all directions, the instrument, whatever it is, is not properly introduced, and, moreover, the stone will not be felt.

In this series of 312 cases there were 204 lithotrities with 9 deaths. In the first 77 cases there were 5 deaths, and two of these were certainly due to lack of experience in much diseased bladders, some tearing of the bladder wall being produced with gangrenous ulceration and septic cellulitis. The others were all from secondary septic bilharzial changes in ureters and kidneys. In the last 127 cases there were three deaths ; one developed dysentery, probably of bilharzial origin, after the operation, but recovered from that only to die later after an operation for strangulated hernia — hardly a case of death after lithotrity; the second, a hemiplegic patient, developed septic thrombosis of the prostatic veins and pelvic peritonitis ; and the third was an old man with an enlarged prostate and retention with overflow of urine and septic kidneys. The largest stone crushed in the series weighed 122 grammes, but there were two cases of larger stones in whom the lithotrity could not be completed and the bladder had to be emptied by perineal section. The youngest patient was aged two. Included in the above also are 6 cases of perineal lithotrity, the lithotrite being introduced through a median incision in the posterior urethra and the stone crushed and subsequently washed out through a large evacuating catheter. One of these, a small boy with a large stone and much distended bladder, died the following day apparently from shock. At the necropsy no other cause of death could be ascertained. Since October 1908, spinal anasthesia by stovaine has been used. for all operations for stone, except in small children, with very satisfactory results.

Perineal lithotomy. This operation was performed in this series in 53 cases ; 34 by median lithotomy with 1 death, and 19 by the lateral

operation with 3 deaths. These operations were done for cases in which it was considered necessary to provide drainage to the bladder and to allow of its subsequent irrigation. A large tube is inserted into the bladder and the perineal incision tightly sutured, the last stitch going through the tube and fixing it in place. Messrs. Down Bros. have made me a *special forceps for introducing a tube* into a deep cavity which I have found very useful in these cases. Essentially it consists of two hollowed blades joined by an obtuse-angled elbow to long scissors handles, the joint being at the second angle between the elbow and the handles. The tube is held in the grooved blades and thus introduced into the cavity and left in place as the blades are slightly opened and the instrument withdrawn. A smaller tube is attached by a glass junction and drainage maintained for as long as necessary, with free irrigation with permanganate or saline solution. With the exception of one case of a very old man, who died from heart failure, the other fatalities were due to septic ureters and kidneys,one as long as five weeks after operation with a large pyonephrosis. In children median lithotomy was formerly practised but has now been entirely replaced by the suprapubic operation. These perineal operations have sometimes been done as a demonstration to students who may after graduation be posted to certain districts where they cannot attempt lithotrity owing to want of practice or the lack of suitable instruments.

Suprapubic lithotomy. Twenty eight cases were done by this method with six deaths. This operation is reserved for children, very large stones, encysted stones, and stones associated with an enlarged prostate; and although many of the operations are comparatively easy, I have never been able to convince myself that suprapubic cystotomy is the simple operation the text-boox would have one believe. The peritoneal reflection in the front of the bladder is often very low in our cases, frequently requiring to be carefully peeled off from the back of the symphysis, and even when the bladder is well distended — a feat not always easy of accomplishment in an Egyptian bladder—the dilated bladder forms a dome behind a veil of peritoneum stretched over the front of it. It is therefore very necessary to thoroughly expose the parts concerned in the operation and to be quite sure the peritoneal reflection is well out of the way before the incision is made into the bladder. Further the firmly contracted thickened bladder lies deep in the pelvis, and unless the stone is a very large one, may not be easily reached and opened. If the stone is large, except in a very roomy bladder, no attempt should be made to deliver it whole but it should be broken with lithotrite, lithoclast, or even chisel and hammer, and removed in pieces to prevent tearing and bruising of an already diseased and degenerated bladder wall. In children and in other cases where the bladder is fairly healthy, an attempt should be made to completely close the bladder with sutures, with or without a catheter fixed in the urethra. A small drainage tube may be passed down to the sutured bladder and the rest of the suprapubic incision is closed. In children I prefer to leave them without any catheter, but in adults a soft catheter is usually inserted and retained in position by means of a special *catheter clip* (made to my directions by Down Bros.) This consists of two flattened rings of soft metal capable of being altered in size by a sliding piece, which may be fixed at any point by a screw. The larger of

these rings encircles the penis just behind the glans and is lightly clipped in position. The smaller ring grips the catheter just after it emerges from the meatus. The two rings are connected together by a thin bar, shaped to the outline of the glans, and when both screws are adjusted the catheter is firmly fixed and does not come out. In one case of urinary fistula the catheter was retained by this appliance without moving for nearly a month.

If the condition of the bladder will not allow the suturing of the wound entirely it must be reduced in size by sutures and a tube stitched into its upper part; but on no account must the bladder wall be stitched to the skin or the deeper structures, or a fistula will inevitably result and persist. The dead space between the bladder and the muscles must be carefully packed to prevent leakage into the cellular space around the bladder, a smaller tube is fitted on to the tube in the bladder, and drainage takes place entirely by syphon action, without the intervention of any other special drainage apparatus whatever. Thorough irrigation must be carried out as necessary through a soft catheter passed per urethram.

Of the six deaths in this series one was from peritonitis from an accidental opening of the peritoneum and infection from a particularly filthy bladder; another died from peritonitis from sloughing of the bladder walls, the bladder being almost completely gangrenous; another of poisoning from opium which was unwisely given to check an attack of diarrhoea after the operation. Post mortem, double pyonephrosis was present and advanced bilharzial changes generally. One small boy died from uraemia with large pale kidneys and another adult from pyonephrosis. The last case was in an emaciated man with a stone weighing 240 grammes lying fixed in a large saccule in the anterior wall of the bladder. The stone was removed entire, and a week later, the patient developed very severe dysenteric diarrhoea from which he slowly recovered, only to melt away and die from exhaustion, with all the symptoms of a septic bilharzial urinary tract. Post mortem he was found to have a very bad bladder, dilated septic ureters, and pyonephrosis. One of my most recent cases was a boy aged 12, with a stone of 150 grammes with a very irregular oxalate surface, but in a healthy bladder, which I was able to stitch up without drainage. He passed his own urine the same evening and made a perfect recovery, and was out of bed in seven days. With him, as with all these cases, he was sat up as soon as possible after operation and encouraged to pass his urine naturally from the first.

STONE IN THE FEMALE BLADDER. When the female bladder is attacked by bilharzia it is usually very severely affected and almost hopeless to relieve. Large stones frequently form in such bladders, and they rarely come under observation till they have almost completely filled the bladder and project as a hard mass through the anterior vaginal wall. The mere fact of an operation being necessary in such a bladder augurs a bad prognosis. Nine operations were performed in these circumstances with four deaths. Four of these were done by the suprapubic route with two deaths, both from the usual bilharzial sepsis. Three stones were removed by vaginal lithotomy and the fistulae

subsequently closed with good results. One of these stones had obviously formed on the sutures inserted at an operation for vesico-vaginal fistula. In two cases the urethra was dilated and the stones removed. One of these patients died, a woman pregnant seven months with terrible urinary sepsis and a stone of 65 grammes. Micturition was so difficult and painful that something had to be done to relieve her. She aborted the next day and died a week later with advanced septic ureters and kidneys.

STONE IN THE URETHRA. Thirteen eases were operated on, but many more were admitted for operation. On careful examination these turned out to be bilharzial urethrae, the grating of a sound against a roughened patch or orifice of a fistula much resembling the touch of a stone impacted in the pouch off the urethra. Our principles of practice for urethral stone, which is always more or less impacted, is, under stovaine, to push it back with a sound or the beak of a lithotrite into the bladder and there crush it. This applies to stone behind the penile urethra. If the stone will not move, an incision must be made into the canal in the perinaeum and the stone caught with urethral forceps and removed. An incision is never made into the penile urethra if it can possibly be avoided, as fistula is almost sure to follow and prove very troublesome to close. Our only success in such penile fistulae has been by putting a tube into the bladder as far back in the perinaeum as possible and draining off all the urine by this route, and then to do a plastic operation on the penile fistula over a straight piece of catheter, which is left in till the wound is firmly healed. The small fistula left in the perineum soon heals after the tube has been withdrawn. If the stone is at or near the meatus it is easily removed by enlarging the meatus and extracting with forceps, and the forceps are also used in the extraction of all stones in the anterior part of the penile urethra. Finally the bladder must always be sounded after the removal of an impacted stone in the urethra. In one such case I removed 16 stones from the bladder.

BILHARZIOSIS OF THE URETERS. Seeing the continuity of the mucous membrane throughout the urinary tract, and especially the relation of each part of it to the portal system, it is not surprising that the ureters and pelves of the kidneys share, though in a lesser degree, in the general infection. The essential features of the different lesions in the ureters are similar to those described in the bladder. We have already noticed the occurrence of papillomata in the bladder at the ureteral openings and these may occur in the lower end of the ureter as well ; but more usually irregular elevations of a much infiltrated mucous membrane obtain. Ferguson has described tiny vesicles with pigmented patches also. A certain variable and irregular thickening of the ureteral walls also occurs, sometimes leading to a constriction of the tube and subsequent hydronephrosis.

The most characteristic appearance of the infected ureter in the early stages is that of a marked generalised infiltration, especially of the mucous membrane, which is thrown into irregular ridges and elevations with a peculiar soft friable surface. The colour is dark grey black, almost quite black, like soot, and is very striking. The ova are all calcified in

these cases and there is some deposit of fine phosphatic concretions on the surface. These appearances in miniature are sometimes seen with the cystoscope in the bladder on the mucous membrane around the ureteral orifices.

The ureters at times are enormously thickened, dilated and tortuous, partly from hypertrophy in an attempt to overcome the obstruction below-back-working—but also to a definite bilharzial infiltration of the deeper coats of the tube. So extensive is the general calcification of the ova that X-ray photos (Lotsy) show in favourable cases the entire outline of the ureters and portions of the bladder, which have become incorporated in one continuous calcified tube.

Small ulcers may also occur, and abrasions, with phosphatic concretions, or even larger, more definite calculi, behind a constriction, in a pouch elsewhere, or at the vesical orifice.

BILHARZIOSIS OF THE KIDNEYS. The kidneys also participate. Small papillomata may occur within the pelvis or calyces and a more or less diffuse infiltration in the same situations. Consequent upon the obstruction and changes in the ureter, the pelvis is very often seen dilated and rather later hydronephrosis develops, and its further condition depends on the degree of sepsis that subsequently occurs. Small phosphatic calculi may be present in the pelvis or calyces,or a branching phosphatic stone may almost entirely fill the cavity. (Bilharzia ova have been found in the kidneys of mummies of the twentieth dynasty by Ruffer). The later appearances are entirely masked by the dreadful septic changes which eventually ensue; and these may be best illustrated by attempting to picture the condition of the whole tract when in this general septic involvement. This really combines the worst possible degree of sepsis acting upon and in conjunction with a very severe bilharzial infection. Thus the bladder is full of degenerated mucous membrane, coated with phosphatic concretions, and probably containing stones, bilharzial debris, and decomposing blood clot. All the various lesions just described form the basis on which this sepsis is grafted, and what little urine the bladder contains is filthy, alkaline, and thick with pus, debris, and clot, and smells putrid. Rarely a vesico-rectal fistula forms, the opening being situated just above the prostate. The ureters are dilated thickened tortuous and irregularly constricted and form part of the general mechanical and septic backworking, with which is also associated hydronephrosis, going on to pyonephrosis, phosphatic stones in the pelvis, pyelo-nephritis, multiple abscesses large and small in the kidney, substance often like masses of softened tubercle, or the kidney may be simply a bag of pus; and septic perinephritis, abscess, and perirenal and retroperitoneal cellulitis constantly occur and may even extend right down into the pelvis. With all this there must be evidences of a general septic infection throughout the whole body. These extreme cases only occur among the fellaheen, who are exposed to constant re-infections and in whom sepsis once introduced never has a chance of being cured. Such cases are quite beyond any hope of adequate treatment.

PLATE 57.



Fig. 1.—An X-ray photograph of a calcified bilharzial bladder showing the outline of the viscus and the ureters, which have undergone a similar change. Dr. G. O. Lotsy.



Fig. 2.—Bilharziosis of the penis, involving glans, prepuce, and urethra. A drop of pus is seen at the meatus, hence the condition was formerly diagnosed as gonorrhoea.



Fig. 3.—A severe case of the same condition with large fistulous openings, much swelling of the organ generally, and marked silkiness and enlargement of the scrotum.

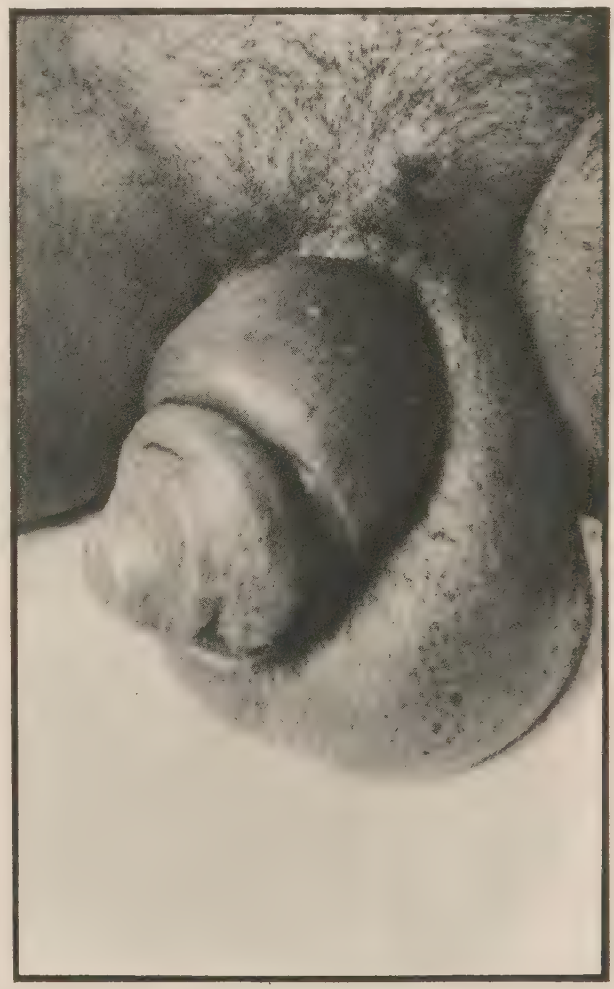


Fig. 4.—A perfect example of bilharziosis of the penis, showing the thickening of the glans, the general involvement of the body of the penis, and the swollen silkiness of the scrotum from obstructed lymphatic circulation.

BILHARZIOSIS OF THE MALE GENERATIVE ORGANS. The most common evidence of the implication of the male generative organs is *urinary fistula* and this is associated with a more or less general infiltration of the mucous membrane of the urethra, from which, or its neighbourhood, the fistulous track originates. I have never seen the eary stage of infiltration of the urethra, but one's attention is usually drawn to it by a burning sensation behind the scrotum during micturition, superadded to the usual symptoms of bilharziosis of the bladder. On examining externally a small hard lump will be felt in the middle line of the perineum; and, on passing a sound, a distinct roughness at a point corresponding to this in the urethra, or even a pocket, over which, after some difficulty, the point of the sound passes and runs on into the bladder. Most of these cases are thought at first to be impacted stones in the urethra, the edges of the pocket being often quite hard and gritty. It is really a small pouch of the urethra due to a bilharzial destruction of a portion of the wall of the canal and gradually deepens to end in a fistula, opening through the skin like a subacute periurethral abscess, at the site of the original lump. My former colleague, Mr. Frank Milton, has well described the two main varieties of these urinary fistulae, and divides them into *roof* and *floor* fistulae. The majority of these fistulae enter the roof or the side of the urethra and are formed originally by the destruction of a portion of the urethral wall by bilharzial deposit, which first extends into the enveloping corpus spongiosum and then into the space between this structure and the corpus cavernosum of one side or the other. Thence it is directed towards the perinaeum and opens externally to one side of the middle line and the fistula is complete. These fistulae arise from a very short length of the urethra, namely the portion between the posterior margin of the scrotum and the bulb, and have not the same amount of hard chronic inflammatory thickening along their track, or the thickening and obstruction of the urethra, as is the case with the floor fistulae.This latter variety is not so strictly confined to the post-scrotal urethra but may also involve the penile portion of the canal. These begin, as already described, in a pouch which acts as a trap, catching and retaining the decomposing matter from the bladder. A septic inflammation is set up in this ulcer trap and a peri-urethral abscess forms with much surrounding fibroid induration, which becomes firmer and firmer, until it is almost of stony hardness, and gradually approaches the surface of the perinaeum, carrying the septic pouch inside it. The urethra in front of the ulcer becomes thickened also and all the anterior part of it is narrowed and not uncommonly completely obliterated by cicatricial tisue, due to slow healing of a long - continued ulceration of the urethra. Those cases vary very much in severity, from a single non-indurated perineal fistula to the formation of a hard indurated tissue, occupying the whole of the perineum and surrounding parts and riddled with fistulous openings in various directions. The skin of the scrotum is often hardened and swollen with firm oedema, and the fistulous track can be felt coming up from the urethra as a firm column of stony hardness. The anterior part of the urethra is much narrowed and the meatus much contracted and there may be a thin purulent discharge, comparable to the *bon jour* drop of chronic gonorrhoea, dripping from the orifice. The fistulous track itself runs in

the substance of a very hard fibrous tissue directly continuous with a much thickened urethra and lined with soft bilharzial tissue in which ova may be found. In advanced bilharzial urethral fistulae of old standing, the tracks may be completely lined with epithelium, probably derived from the mucous membrane of the urethra. Often quite a small external opening exists and a series of tortuous tracks deep in the perinaeum. The corpus spongiosum may stand out like a fibrous tube and be completely separated from the corpora cavernosa on either side and all three covered with epithelium which also lines the deep gutter between them. At several places in the lateral wall of the corpus sporgiosum are seen the openings of the fistulae. In the earlier stages of fistula formation, worms are common in dilated veins outside the fibrous sheath, and in those of the peri-urethral tissue ; but with the advance of sepsis they seem to retire into the venous channels at some distance from the fistulous track. In extreme cases the fistulous tracks may open on to any part of the anterior abdominal wall as far as the umbilicus, or anywhere in the perinaeum, buttocks, sacral region, and upper part of the thighs ; and they often tunnel through the scrotum in all directions,but I have never seen a case in which the testis itself has been involved.

Subcutaneous deposits of bilharzia may occur in different places, but especially about the perinaeum and scrotum, and these increase in size to form hard indurated masses, which eventually soften in parts and open externally by a number of fistulous tracks. They may also approach the urethra and open into it and lead to a true fistula, very often with many branching tracks running irregularly throughout the fibrous mass. Only this morning I have removed a large mass of this kind which had no connection whatever with the urethra but which had involved the greater part of the left side of the scrotum, both superficial and deep, but had not touched either the spermatic cord or the testicle.

When the penile urethra is especially affected and fistulae perforate the erectile tissue of the penis, extraordinary deformities may be produced which I have classified separately as BILHARZIOSIS OF THE PENIS.

1. *Bilharziosis of the glans penis and the prepuce.* A characteristic bulbous swelling of the end of the penis may be seen, as if the whole severity of the disease lies in the glans prepuce and the first inch or two of the urethra. The surface of the glans is dry and pitted or covered with fine scars and, owing to obstructed lymphatic circulation by the presence of bilharzial infiltration, the substance of the glans becomes swollen and hard and merges into a similar hard swollen prepuce, forming a distinct collar of hard oedema sharply separated from the body of the penis. This furrow generally lies in the circumcision scar. The orifice of the urethra is much constricted and is often eccentrically placed. There is frequently a discharge from the meatus, not unlike gonorrhoea on casual examination.

2. *Bilharziosis of the glans, prepuce, and body of the penis.* In other cases the skin and subcutaneous tissues of the body of the penis are also involved. Behind the deep furrow the penis may be swollen, to almost any extent, with the same peculiar solid oedema, often extending to the root of the organ, there to be sharply limited by another deep furrow. Usually

PLATE 58.



Fig. 1.—Bilharziosis of the anterior part of the penis, showing particularly well the fistulae opening just behind the glans, and the very localised involvement of this part of the organ.



Fig. 2. — The same case showing the circumcision scar and its relation to the swollen part. There is some involvement of the body of the penis but the anterior part is much more severely affected.



Fig. 3.—A case of elephantiasis of the penis due to filaria, to compare with preceding figure. The glans is here seen to be quite normal and the corona not thickened in any way, nor are any fistulae present.



Fig. 4.—A severe case of bilharziosis of the penis, with multiple fistulae running through a false elephantiasis of the whole scrotum and penis and its surroundings. The meatus was much narrowed and no way could be found down the urethra.

PLATE 59.



Fig. 1.—A typical case of bilharziosis of the penis in a young boy.



Fig. 2. — Severe bilharziosis of the penis and false elephantiasis of the scrotum.



Fig. 3.—The largest case of false elephantiasis of the scrotum due to bilharziosis I have seen. The urethra was involved in a massive fibrous tissue. The scrotum was entirely removed and ultimate result quite good.



Fig. 4—The last stage in bilharziosis of the penis with very marked deformity, scarring, fistulous tracks, and false elephantiasis.



Fig. 5.—Permanent erection from bilharzial infiltration of the penis. The whole organ is very hard and there is a very contracted bladder.



Fig. 1.--Bilharziosis of the penis, ending in ulceration and scarring of the glans above and around the meatal orifice.



Fig. 2.—Bilharziosis of the penis which has become epitheliomatous with secondary involvement of the glands in the groins.



Fig. 3.—Multiple urethral fistulae with much scarring between the fistulous tracks.



Fig. 4.—Severe bilharziosis of the bladder which has become malignant, forming a hard mass above the pubis and in the centre of it a fistula communicating directly with the bladder.

Several of the preceding photographs of bilharziosis of the penis were first published in the Journal of Tropical Medicine, of Dec. 1st. 1909.

many fistulae are seen running through this swollen tissue and they generally open into the floor of the urethra just behind the glans. There may also be a soft silkiness of the skin of the scrotum from partial lymphatic obstruction at its neck. In advanced cases the urethra is much more extensively affected and numerous fistulae run irregularly through a mass of false elephantiatic tissue, which not only involves the penis and its coverings but also extends to the scrotum, perinaeum, and surrounding parts. In such cases the fistulae come from the urethra just in front of the scrotum or the perineal urethra, and the condition is very similar to that already described in the last section.

3. Bilharziosis of the glans penis ending in epithelioma. The bilharzial infiltration of the glans may give rise to a superficial ulceration and, with the constant irritation all round, epithelioma is not infrequently grafted on to it. In the end there may be an extensive infiltration of the urethra and a rapidly spreading epitheliomatous ulceration of the glans, with secondary glands in the groin and pelvis and all the usual distant deposits.

4. Bilharzial deposits in the erectile and subcutaneous tissues of the penis. In certain cases deposits of bilharzial tissue, generally in the form of hard fibrous lumps, occur in the corpus spongiosum or even in the corpora cavernosa ; and at an early stage these can be completely excised and are seen to have no connection with the urethral canal. It is only the presence of bilharzia elsewhere and the microscopical finding of ova in the section that confirm the diagnosis. These lumps may, however, enlarge, soften, and invade the urethra and form ultimately a fistula, as has been noted in the case of similar lumps in the perinaeum. Similar subcutaneous nodules occur in the skin covering the body of the penis and have the same characters. In the last stages of a generalised bilharziosis, the whole penis may be irregularly infiltrated with fibrous masses leading to a continuous hard stony distorted erection of the organ, which aggravates the suffering of the patient very much indeed. Corresponding *fibrous nodules* occur in the *spermatic cord,* closely applied to the veins or in the epididymis. They may be multiple and remain hard, or soften, like a tuberculous mass, break down, and infiltrate the overlying skin. They may be completely excised and do not recur, their only importance lying in their differentiation, by subsequent microscopical examination, from tubercle and from thrombosis.

The PROSTATE is early affected, either by infiltration of the vesical mucous membrane on its anterior surface or by an infiltration of the gland itself generally, with many calcified ova. The symptoms are often very much like those of prostatic hypertrophy, but the diagnosis is readily made by cystoscopic examination or after suprapubic cystotomy. When the infiltration is at all severe, the prostate is much hardened and becomes fibrous, leading to incontinence of urine from destruction of the sphincter muscle. Similarly the VESICULAE SEMINALES share in the general infiltration and at times, quite early in the disease, give rise to haemospermia, which I have known to be the first symptom of a bilharzial infection. At a later stage of the disease, the vesiculae become bound up in the mass of fibrous tissue at the base of the bladder and behind it, and

are ultimately completely incorporated in a thick fibrous mass, which also involves the lower ends of the ureters. On cutting into this mass, the remains of the vesiculae may be seen as a group of thick-walled cysts filled with brown gelatinous material.

BILHARZIOSIS OF THE FEMALE GENERATIVE ORGANS. In the general invasion by bilharzia the female generative organs do not escape, and all the usual changes common to bilharziosis of mucous membranes may occur. Externally, hard papillomatous masses may be found on the labia, much resembling venereal warts at first sight; and, at the orifice and about the vestibule, an infiltration of the skin with shallow ulceration amidst softened tissue is not uncommon. This ulceration may cause considerable loss of tissue round the upper part of the hymen and the clitoris and even encircle the urethral orifice. Very rarely this ulceration is so extensive as to be mistaken for epithelioma. A bilharzial urethral caruncle may present at the lips of the urethra, or a small papilloma, with a long pedicle attached to the base of the bladder, may project like a ball valve from the urethral orifice. The vagina may be deeply infiltrated and generally thickened,and a prolapse of the mucous membrane may occur. It may be thick with papillomata which may also grow from the cervix uteri. Though the cervical orifice may be infiltrated and be studded with small fibro-adenomatous nodules I have never seen any involvement of the uterine mucous membrane. Fibroid masses are met with in the broad ligaments or attached to the ovaries; and in all cases of old chronic bilharziosis of the genito-urinary tract, the ovaries are found extremely scarred and fibrotic and containing numerous ova in the dense stroma of the organ. This fibroid investment of the ovary is of such density as to preclude the possibility of the escape of ova into the Fallopian tubes and this condition must therefore be considered as a potent cause of sterility. (Ferguson).

The diagnosis of bilharziosis. So general is the distribution of bilharziosis among the native population of Egypt that in almost all urinary troubles we assume it is present; and we are only concerned in estimating the degree of infection and its possible influence upon symptoms and prognosis. Moreover, particularly in the country districts, a certain degree of bilharziosis is looked upon as inevitable, and indeed, as we have said, the early haematuria is even considered a sign of manhood without which the begetting of children is impossible. In these circumstances early diagnosis of tbe disease is difficult to establish, especially as much reticence is shown in admitting its existence. On the other hand, the disease may be quite well established but give rise to no symptoms whatever.

The very earliest symptoms of infection have been mentioned in Fairley's report among soldiers; but among Egyptians there can be no doubt that the most common sign of bilharzial infection is *a painless haematuria*, which may persist as the only sign for quite a long time, even for years, in single infections. The urine is quite clear and passed without any difficulty or sense of urgency: but, with the last ounce or two of the urine, some drops of fresh blood are voided. Long before this symptom

PLATE 61.

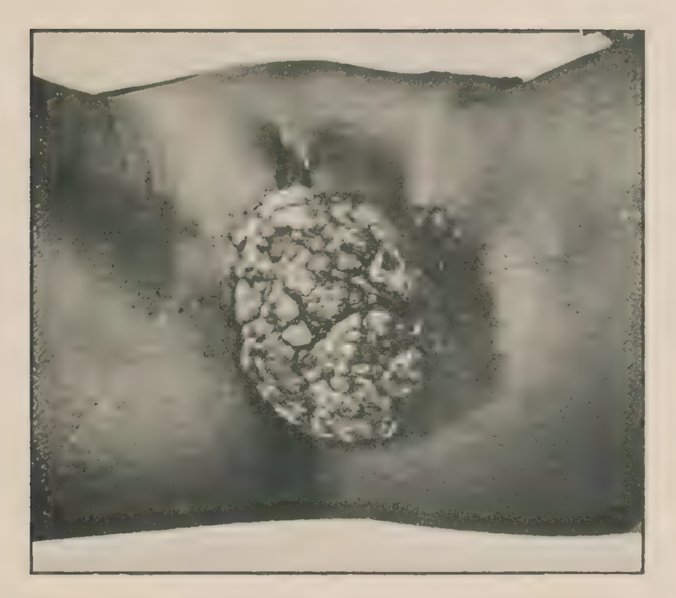


Fig. 1.—Bilharzial papillomata of the left labium majus. P. A.



Fig. 2. — Bilharzial papillomata of the right labium majus. P. A.

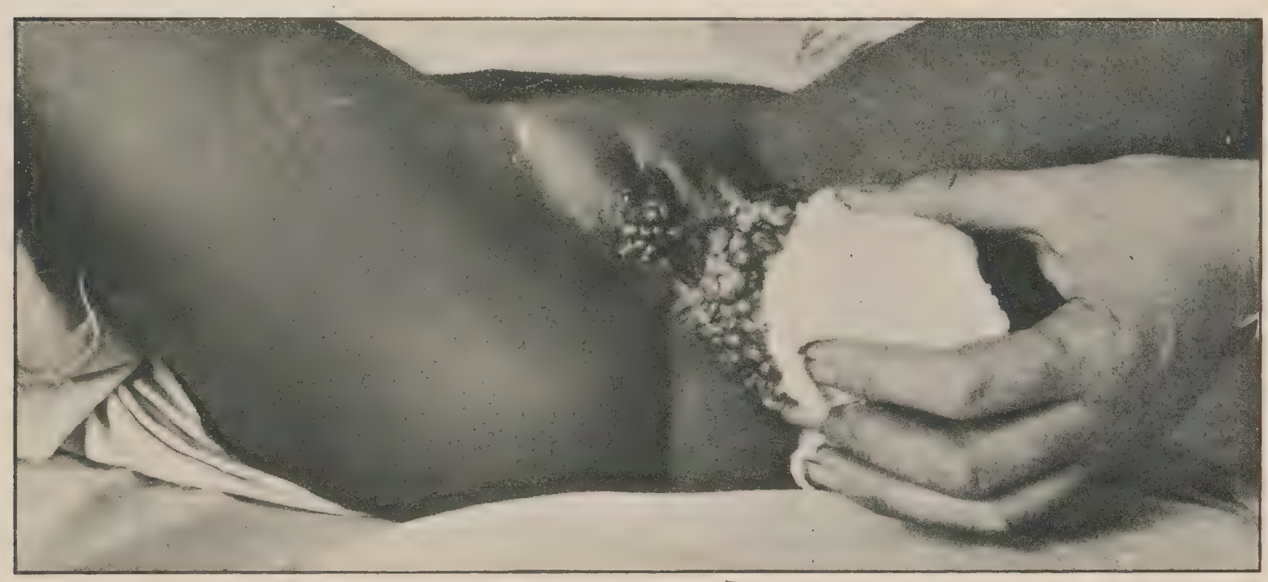


Fig. 3.—Bilharziosis of the right labium majus. P. A.

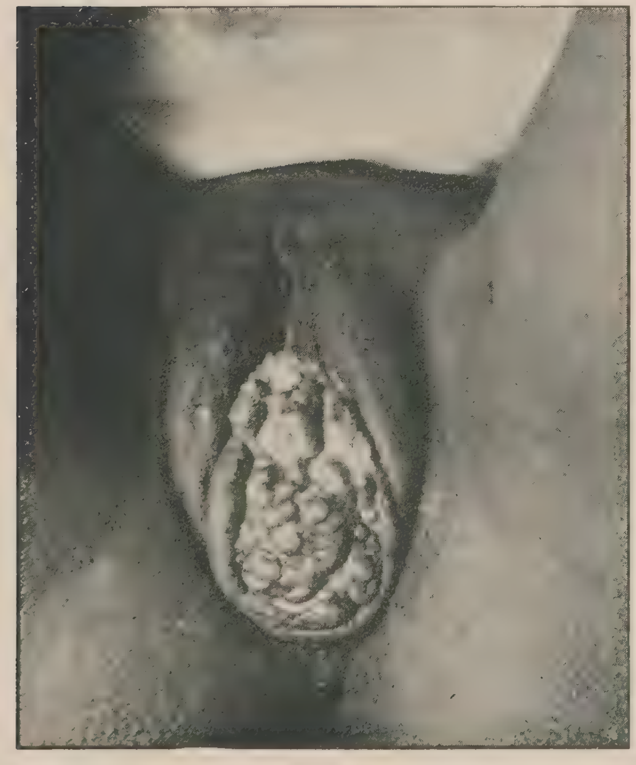


Fig. 4.—Bilharziosis of the vulva and vagina. P.A.



Fig. 5.—Bilharzial papilloma of the cervix uteri. P. A.

has appeared, ova may be found in the urine, if a systematic microscopical examination is carried out for any reason,as for instance for life insurance, and these will be more abundant in the presence of haematuria. The microscopical characters of these ova have already been described and it is more satisfactory whenever possible to examine the centrifugalised deposit.

After a variable period an *irritation* or burning sensation is experienced during micturition and especially in the latter part of the act. This tends to become more insistent till there is an increased frequency, brought about by the aggravation of the irritation deep in the perinaeum at a point corresponding to the neck of the bladder. Haematuria does not necessarily occur with each act of micturition but slowly becomes more regular and abundant as the group of symptoms, commonly known as 'irritability of the bladder', develop and persist. Transient pains in the loins and in the suprapubic region may be noted and even mild attacks of pain resembling renal colic ; but in an uncomplicated case, in the absence of sepsis and the risk of reinfection,no further symptoms may ever appear. The examination of such a case will not disclose any swelling or tenderness, either over the bladder ureters kidneys or perinaeum ; and the urine will have the appearances already described and only furnish microscopical confirmation of the diagnosis. The passage of a sound produces a slight irritation in the urethra, often with momentarily severe burning pain as it enters the bladder. The softened mucous membrane and its folds may be felt and, towards the base, bunches of papillomata or trabeculations. A tender, rather thickened, prostate may be felt also and its outline defined with a finger in the rectum. A small hard uric or oxalate stone may be discovered ; and the urine passed after the removal of the sound will probably contain some fresh blood and, in this specimen, ova are numerous.

Examination with the *cystoscope* shows evidence of softened infiltrated mucous membrane with wet sea-sand appearances, either in patches or fairly evenly distributed over the mucous membrane, especially about the trigone. Groups of small raised papules or yellowish elevations of vesicles with radiating lines of dilated vessels may be seen projecting from the mucous membrane, not unlike tubercles (Thomson Walker). Ridges of tiny papillomata on infiltrated areas are common, and isolated papillomata, irregularly scattered over the trigone and around or even in the orifices of the ureters. A stone may be seen, and the whole light reflex of the bladder may be entirely altered to a bright yellow, from the enormous numbers of calcified ova in the mucous membrane ; and the scattered coppices of nodules present a very characteristic sparkling appearance with darker spots of less thickly infiltrated nodules.

Progressive stages of the disease are well seen by cystoscopic examination at various degrees of infection. The very earliest appearances of small elevations about the trigone, described by Fairley, I have never seen in an Egyptian bladder and these probably represent the very earliest visible lesions. At a rather later stage there may be a more or less general hyperaemia of the mucous membrane, but especially marked about the trigone and particularly in the neighbourhood of the ureteral orifices. Iregular patches and ridges of dark-red infiltrated mucous

membrane occur also, and scattered through them and apparently perched on them are numbers of bright yellow or almost white globules presenting a brilliant glistening appearance under the illumination of the cystoscopic lamp. These tiny balls are like tubercles but are more glistening, are smaller, and stand out on the surface of a raised infiltrated membrane. These are evidently calcified ova. Around them the light reflex of the bladder wall becomes progressively less red and more yellow, and there is an indistinctness in the finer details of the pattern of the mucous membrane. At a rather later stage, this indistinctness has become a definite sandy blurring, the nodules are no longer evident, and all round the orifices of the ureters, one or both, is seen an irregular raised hummocky area, like a sand dune, in the midst of which are some depressions, one of which, with a dull-red margin all round and looking more like a deep slit than the rest, jets out urine from time to time and is the buried orifice of the ureter. This appearance in time rather changes, as the calcification of ova becomes more complete and diffuse, till it looks uncommonly like a sand picture, such as is made on a piece of cardboard by fixing the sand with gum. Beyond the margin of the dune are irregular areas of dilated vessels of hyperaemic infiltration.

Sometimes, scattered about on a sandy area of varying thickness and maturity, are seen minute black or greyish-black spicules, which appear to be on a tiny pedicle, and look like droplets of jet on the fringe of a feather, and which are similar in appearance and formation to the condition described in an early stage of infection of the mucous membrane of the ureter. They are really calcified ova with phosphatic concretions and they present a very characteristic appearance. In a recent case I have a note that "there is a large area of wet sea-sand, which has apparently dried in billows all round the left side of the lower part of the bladder, especially around the left ureter, which presents a deep depression with swollen infiltrated lips. The right ureter lies in the middle of many bunches of bright glistening balls with thick sea-sandy bases. The general red reflex of the bladder is changed to a yellow and very few blood vessels are seen. Posteriorly there is much fasciculation of the bladder and the general impression is that of a thickened chronically infected bladder."

In other cases papillomata are prominent, but it is evident, both from cystoscopic and other means of examination, that papillomatous change is not nearly as common a change in the bladder as it is in the intestine. Groups of papillomata are seen with their usual characters. Nearly all are yellow at the tips, from the presence of calcified ova, and many of them brownish-yellow throughout and implanted on a yellow sea-sandy membrane. They are specially seen around the orifices of the ureters and the trigone, though larger and more pedunculated examples are found at other parts, and especially in the lower part of the anterior surface.

One rarely sees the very early general infiltration of the mucous membrane with the cystoscope; in most cases it has already lost its redness and become powdered and sandy. Small patches are, however, commonly seen scattered throughout an already obviously thickened bladder wall.

All the various kinds of stone and concretions are seen without difficulty until the later stages of the infection supervene.

The various later lesions, both primary and secondary, already described, may be seen by the cystoscope, and also the prostate, rather enlarged and thickly coated with all the usual signs of an infiltrated membrane.

FURTHER PROGRESS OF THE DISEASE. As we have already indicated the comparatively early changes may never go any further; and in time the ova are gradually—very gradually, even extending over ten years or more—ejected from the body in urine and faeces and a complete cure results. But, unfortunately, it is only too common to find a steady aggravation of symptoms owing to repeated reinfections. In this connection it has been suggested that the entry of the infecting agent is by way of the mucous membrane of the urethra, during bathing, and that the practice of circumcision, which originated in Egypt, was instituted to minimise infection from bilharzia; and, without knowing anything of the recent pathology, would have the effect of preventing the water-borne cercariae from being retained under a long prepuce and so having a better chance of making their way into the meatal orifice. Certainly 'penis sheaths' were in use in Ancient Egypt, and are pictured on the walls of the temples (Pfister). These are similar in appearances to the more modern cock boxes (K.C.B.) of the Kaffirs and Zulus.



An ancient Egyptian of the XIXth Dynasty, 1350--1200 B.C., hunting in the marshes. He is carrying his sling and is also wearing his 'penis sheath' to protect himself from bilharzial infection (Pfister).



A modern penis sheath, as worm by the Kaffirs and Zulus, whilst bathing and in full dress; locally known as a 'K.C.B.' (Kaffir Cock box).

Once *reinfection* has occurred, fresh broods of worms appear in the liver and start the long series of changes already detailed, and thus we may find lesions of very different stages of chronicity in one and the same viscus.

The condition brought about by the persistent progress of the disease and the succession of reinfections is that of *chronic cystitis;* but, exactly how and when septic infection supervenes is hard to say, though once it has appeared it finds a splendid medium for its development

throughout the whole tract. The urine becomes alkaline, is turbid and often much blood-stained, offensive, full of debris pus mucus and phosphatic pieces,and it is only the presence of bilharzia ova and the associated symptoms that distinguish it from a cystitis due to any other septic infection. The symptoms are still further aggravated by the presence of stones in the bladder. Examination with the sound will demonstrate the presence of papillomata, roughness of the wall, fasciculated bladder wall, and other characteristic lesions, and give an idea generally of the form and capacity of the bladder and the thickness of its coats. The cystoscope may still furnish some information, if the bladder can be washed sufficiently clean, and a hard thickened yellow granular mucous membrane may be seen with large masses of low-lying papillomata, all yellow with calcified ova and growing especially abundantly around the trigone and the orifices of the ureters, which themselves are thickened and dilated in varying degree, depending upon the intensity of the bilharzial infection within them and the pelves of the kidneys. Abraded areas with concretions may be seen and localised thickenings of infiltrated mucous membrane. At this stage, which is probably the last sight one has of the cavity of the bladder, the red reflex may be entirely lost and a brownish-yellow field, both on mucous membrane and on papillomata, altogether replace it. Later on it becomes more and more impossible to wash out the bladder clean and no satisfactory view can be obtained.

The LAST STAGE OF THE DISEASE presents a truly dreadful picture. The patient is in the last stages of weakness emaciation and exhaustion. He often carries his scrotum in his hand and has constant micturition, really an incontinence and dribbling, with pain in the penis and all round the perinaeum. A very small quantity of urine is voided at a time which is very offensive, grey-green in colour or dark with altered blood, and, on standing, it deposits phosphates, debris, blood corpuscles, pus and ova. A hard mass may be felt in the suprapubic region which is not tender but of stony hardness and extends laterally for some distance. Sometimes an atonic fibrous bladder is found, with retention of urine or overflow. One or both kidneys will be found enlarged and tender, or in a condition of pyonephrosis; and the much dilated tortuous and thickened ureters are easily palpated through the very thin abdominal wall. The whole course of the urethra may be hardened or, on the other hand, may be quite unaffected. In other cases again, all the various appearances described under bilharziosis of the penis and urinary fistulae may be very much in evidence, and a hard distorted permanent erection is the last straw. On rectal examination, the bladder will be felt hard and contracted and, bimanually, the great thickening all around the bladder will be well appreciated. On introducing the sound it can often only be passed just beyond the neck of the bladder into the much contracted cavity, and masses of bilharzial tissue crusted with concretions may be indistinctly felt. In such cases a perineal opening is made in an attempt to relieve the patient, after which he quietly melts away, with a marked increase of his anaemia emaciation and diarrhoea, and with all the evidences of a hopelessly septic urinary tract.

The diagnosis of the urethral and penile conditions, as well as the lesions met with in the female generative organs, is quite easy, provided a section of the tissue removed is examined microscopically. The ova and the typical infiltrating tissue at once furnish a certain diagnosis.

THE TREATMENT OF BILHAZIOSIS. It will be readily understood that there are many difficulties in the treatment of this disease. As we have already indicated it may exist for some time without giving rise to any distinguishing symptoms ; and on the other hand it may be concealed until the irritability becomes as urgent as to compel the patient to seek advice. Moreover, while this is the position among the better class, the fellaheen — agricultural labourers and farmers — are utterly indifferent to its presence and consider their infliction as a gift from God, or as Fate, 'kismet' (pronounced ismet). Being thus ordained, they will do nothing for it until a very advanced degree of infection has been attained. Among the better classes, with a mild degree of infection, a combined treatment, intended to assist the ejection of ova from the body and to prevent the possibility of reinfection, must be adopted. This in principle consists in sending the patient to a country in which bilharzia does not exist, and in putting him on a strict regime calculated to assist the natural elimination of the ova. Such cases, whether sent abroad or placed in conditions free of the risk of further infection at home, may and do go on discharging ova in the urine for ten years or even more ; but eventually perfect cures, as evidenced by complete relief of sypmtoms and the absence of ova from the urine after repeated examinations, constantly occur. This counsel of perfection cannot, however, be suggested, much less adopted, in the vast majority of cases, as nothing of this sort can be followed by the average middle class patient or by the agricultural labourer, whose very livelihood depends upon his ability to work his land.

Prophylaxis. The whole question of prophylaxis of bilharzia infection has been put on an entirely different basis by the discovery by Leiper of the true infecting agent, the cercariae. Formerly, in our ignorance, we were endeavouring to find some adequate means of fighting the miracidium or free-swimming embryo and got 'no forrader', because our knowledge was incorrect and our premises inaccurate. The whole question deserves a volume to itself and is not yet thoroughly worked out ; but, briefly, Leiper's proposals, or rather his indications along which prophylaxis will tend, are as follows :—

"The whole question, primarily, is one of water, which must be treated with the object of first killing the cercariae and then the snails, which serve as their intermediary hosts. Perennial irrigation has enormously increased the prosperity of the people and the country, but it naturally leads to an increased infection with bilharziosis in the light of our present knowledge. A striking example of this is seen at Esneh where, around the town, basin irrigation is still practised, with an almost complete absence of bilharziosis : whereas both to the north and south of the district, with perennial irrigation, the disease is particularly rife. The snails have a much better chance of propagating in a constantly or intermittently wet soil than they have when the whole country is under water for several months in the year. In fact, in order to break the life cycle of the bilharzia worm one must find some simple means of destroying it during the free-swimming infective stage or of depriving it of its essential intermediate host.

In *large towns*, where the water is pumped up from the Nile, and probably often from infected sites, to render this innocuous all the water should be properly filtered. This is always done to some extent; but so

much unfiltered water is required for gardens and other purposes that the risk of infection is still very considerable. A certain amount of protection is afforded by the fact that the cercariae only live for about 36 hours ; and water that has been stored for two days or more and is kept free of, or apart from, possible contact with the intermediary hosts is quite safe. It must be remembered that water pumped up from the Nile at Cairo may have become infected with cercariae even as far south as Minieh at the height of the flood and be still infectious as it passes the city ; hence the necessity for filtration and the danger of supposing that because there are very few infected snails near Cairo the danger has passed. The infectivity in these cases is due to the entry into the Nile of various drains from infected districts, the cercariae being hurried along at varying rates, depending upon the velocity of the Nile flood and, naturally, of the time of the year. There is more risk of these distant infections during the autumn, when the current races along at a rate, sometimes, of 150 kilometres a day. This danger of infection will naturally vary according to the state of the river and the water communications. In large towns, therefore, the main source of danger is the cercariae, which must be fought by filtration of the water ; but, at the same time, all the means at our disposal for the destruction of the intermediary hosts must not be neglected.

In *agricultural districts*, however, the fellaheen, from the nature of their work, are constantly brought into the closest contact with infected water and all around them are multitudes of intermediary hosts lying ready to perpetuate the life cycle of the worm. The most efficacious method of dealing with the snails is drying ; and at Marg the periodical stoppages of water during the rotations, for 15 days at a time, effectively killed practically all these intermediary hosts. Any that remained might be killed off easily by the use of a chemical manure, such as ammonium sulphate, within a few hours. With a combination of regulated rotations and clearing of the smaller drains, especially during the months from May to July, much might be done ; but the whole question is so vast that, for the moment, we can do nothing more than advocate its utility aud await a more favourable opportunity of putting these considerations into practice. All other sources of contamination of the canals and waterways generally, by promiscuous defaecation or soiling with urine or faeces, would require to be dealt with also; and the planning of new villages and the re-modelling of old, to minimise possible infection, would also be included. The whole question of surface drainage and the water supply of the villages, ensuring it being taken from deep wells and not from possibly contaminated surface pools or shallow water-courses, would be also in the scheme.

As regards *individual prevention*, the providing of filtered water, both for drinking and bathing, prevents any risk from infection. The cercariae penetrate the skin in the process of infection very rapidly, and when discharged in ordinary tap-water, usually live about 42 hours. A considerable number survive 36 hours but all are dead in 48 hours. They are apparently unable to derive nourishment from water. An infected snail will continue to discharge active cercariae for a long time, even as long as three weeks. The cercariae die at once if really dried; and if oil is placed on the surface of the water in which they are present they die.

within a few hours. They require oxygen and come to the surface of the water nearest the air. They can live at a temperature of 45° C; but die if the temperature is even temporarily raised to 50° C. The cercariae are killed immediately in 1-500 hydrochloric acid; and many other antiseptics and salts kill them very quickly. Among the most potent in this way are salicylic acid, chinosol, cystopurin, microcidine, beta-naphthol, emetine, thymol, fresh chlorinated lime and sodium bisulphate.

The cercariae will not pass through ordinary filter-paper but will traverse several layers of sand if there is a continuous flow of water through it.

Unfiltered water from canals ditches or birkets may be rendered safe by keeping it stored for 48 hours, heating it to 50° C. or treating it with chemicals. The two most commonly used are sodium bisulphate, in the form of tabloids of 1 gramme to the litre, as 1-1000 kills all cercariae immediately; or by adding bleaching powder, 20 parts per 1,000,000, and afterwards dechlorinating the water.

Finally, personal contact of any kind with unfiltered water is risky. When water is collected no infective snail must be admitted, and, to ensure this, the intake pipe should be screened with mosquito gauze or phosphor bronze wire gauze. Water in wells and sakkias is safest and so far no snails have been found in these. Shallow sand-filters are not satisfactory as after fifteen minutes cercariae pass through four inches of sand. Infection of snails takes place at any period of the year."

Such are Leiper's conclusions and further investigation and experiment are still necessary to evolve a really practical working scheme to rid Egypt of this universal pest.

A few years ago I wrote the following paragraph, and it is interesting to reproduce it here in the light of our more recent knowledge:

"Prophylaxis generally consists in the avoidance of exposure of the feet and legs, hands and arms, and the skin surface generally, to infected water or mud; the use of boiled water for washing and ablutions; the immediate disinfection of infected urine and faeces, and the filling in of birkas, which are mainly used as latrines, but also for washing clothes and as drinking water indifferently. These measures are very difficult to adopt in Egypt, and such suggestions as the wearing of boots and gloves while working in the irrigated fields are so impossible of attainment as to be quite ridiculous. We can, however, rescue the younger men of all but the very poor from their country environment, and put them to school and make clerks of them; but there the practical side of prophylactic proposals ends."

The general treatment of bilharziosis. Having thus dealt with the question of prophylaxis, we must now consider the various means we have at our disposal of dealing with the different stages of this disease. Naturally our first efforts must be directed towards the destruction of the parasite itself in the blood. We are at once confronted with the difficulty, that any drug, sufficiently powerful to kill the worm there, may have such destructive effects on the blood itself that serious, if not fatal,

consequences may result. Many drugs have been proposed but their results have not—in other hands—come up to the expectations of their original proposers. Thus, salvarsan has been much lauded, but my colleagues, Day and Richards, in a series of very careful observations, came to the conclusion that it was absolutely useless. Some degree of success in simple, infections has followed the intra-venous injection of perchloride of mercury. This method was first employed by Dr. Binet of Cairo, and Clayton-Greene reports a case in which considerable benefit appeared to follow its use. The solution consists of one milligramme (0.001) of perchloride of mercury in five minims (0.30) of sterilized normal saline solution and it is injected into the veins of the forearm twice a day for a period of from six to eight weeks. The strength of the solution may be gradually increased until two milligrammes are given twice a day. Personally I have never used this treatment, as it is only very rarely that sufficiently early cases present themselves, either in private or in hospital practice, in Egypt.

Christopheron has recently reported encouraging results, in early and presumably uncomplicated cases of bilharziosis of the bladder, from the intravenous injection of tartar emetic. He advises the use of a stock solution of 1 grain of tartar emetic in 20 minims of distilled water; and each 20 minims of this solution is mixed with 30 minims of sterilized normal saline solution and injected into the right median cephalic vein.

The injection is given every second day in slowly increasing doses till 2 grains are given at one time, and an average course of treatment amounts to 30 grains.

Great care must be taken in the injection as the drug has a very destructive action on the soft tissues, and large sloughs may form round a faulty injection. Dr. Abd el-Halim Mahfooz, P.M.O. of Beni-Suef hospital, has found that repeated small doses at intervals of 2-3 days have a beneficial effect in cases of marked haematuria and irritable bladder.

Experiments are now being made on artificially infected monkeys by Fairley to decide the efficacy of this method of treatment; and until these are completed too much must not be expected from tartar emetic, which, in addition to its local caustic effects on subcutaneous tissues, is a powerful and rather uncertain general poison. An autopsy on one fatal case, made by Major Archibald of Khartoum, showed that though no adult worms were found, the bladder had the typical sandy patches and contained numerous eggs. Sections of the organs showed the marked fatty changes produced by the drug, with all its usual poisonous effects through all the body.

Christopherson's communications may be studied in detail in the Lancet of September 7th 1918, the Journal of Tropical Medicine and Hygiene for October 15th 1917, and the British Medical Journal of December 14th 1918, and well repay perusal. His papers open up a very interesting field of possibilities, but some time must elapse before the true value of this method of treatment can be estimated.

Dr. Reguzis of the Greek Hospital in Cairo, has experimented with a form of serum derived from bilharzia patients, which he calls "Bilharzia red serum", but so far as I am aware, no results have yet been published.

Similarly, Day has been working with microcodine by intravenous injection with promising results, but he is not yet in a position to draw any conclusions from his experiments; and Diamantis reports good results from emetine.

How then do we treat the milder degrees of this disease? Every prophylactic measure possible in the circumstances of the case must be adopted; and then a course of drug, mineral water, and diet regime commenced and rigorously followed. The object of it all is to promote a free discharge of diluted urine, which will act as a continual flush, and, being rendered antiseptic as far as possible, will also keep the urinary tract free of sepsis. By producing and maintaining this condition the ova are discharged from the mucous membrane of the whole tract — and incidentally also from the intestinal tract—in course of time—like any other foreign body.

I generally start by giving ten minims (0.60) of extract of male fern in capsule, for the first few days twice and then three times a day; and a mixture of buchu and hyoscyamus as follows: —

Citrate (or acetate of potash)	1.25
Tincture of hyoscyamus	2.0
Glycerine	1.50
Infusion of buchu to	30.0
Four times a day.	

I continue these steadily for a fortnight. The irritation and the slight haematuria are often soon relieved by the male fern; and this is then stopped and the mixture continued with the addition of benzoate of ammonia, 0.30, for some time. Methylene blue in 0.30 capsules three times a day may also prove useful for the irritation.

Repeated daily doses of the stock adrenaline solution (1-1000 of normal saline solution) often prove very effective in checking the haematuria and relieving the irritation.

To assist the flushing of the bladder, I order Vichy (Celestins), a litre bottle a day, and plenty of plain water, milk and water, barley water and a decoction of the tufts of the pods of maize — Indian corn — a drink endowed with many virtues and known as "*mayit shawashi-il-dourrah*" among the Egyptians. Gradually the buchu mixture is given up in favour of urotropin in good doses, 0.50 three or four times a day, with preliminary treatment of the urine, if a tall alkaline, with acid phosphate of soda, 1.0 in packet three times a day in water, or benzoate of ammonia, 0.30 in cachet. Vittel water may now be substituted for the Vichy for a change, and from time to time Contrexéville or Kissarna water may be used. The urine must be frequently examined and any tendency to alkalinity or the deposits of phosphates corrected by acid phosphate of soda, or the benzoates, and the omission of Vichy or other alkaline water. (I have no faith in boracic acid as an acidifier of the urine. It very easily gives rise to dyspepsia, often quite severe, and diarrhoea, and, quite apart from this disadvantage, is not so efficacious as either of the other drugs.)

With the drugs and regime above-mentioned, we want very little else; but urodonal 4.0, three times a day in Vichy water, for periods of ten days twice a month, is often very useful; and a general tonic treatment with an iron and arsenic pill is very advisable.

My usual prescription is as follows :—

Sulphate of iron	0.15
Extract of nux vomica	0.015
Arsenious acid	0.001
Excipiens	q.s.

For one pill. One pill three times a day after meals.

The *diet* consists largely of milk, and milky and starchy foods, with a small quantity of white meats and fish; and the avoidance of all red meats, made-up dishes, pickles, preserved foods and fish, and obviously indigestible articles of diet. Fruit and vegetables may be allowed and, throughout the whole course of treatment, the rule must be plenty of fluids.

The *bowels* must be kept properly regulated and regular exercise insisted upon. Cycling and riding must be tabooed until all feeling of irritation has passed.

This general treatment must be adopted in practically all cases of bilharziosis, mild and severe, modified as necessary to suit the particular case. Usually very little benefit results from washing out the bladder, but large irrigations may be tried, either through a large-eyed soft catheter or by Janet's method, with solutions of silver nitrate, 1-1000, gradually coming down to 1-500, twice a day; or permanganate of potash, 1-10,000, reduced gradually to 1-2000; or, perhaps the best of all, oxygen water (12 volumes to the litre) in a strength of 1-10 in warm sterilized water. The use of stronger or caustic solutions is only detrimental and in any case is quite useless.

Suppositories of belladonna and morphine, or adreno-styptique (Midy), may be used twice a day in the presence of severe irritation; and hot rectal injections of saline solution, after the lower bowel has been well cleared with enemata, may also afford considerable relief.

As the *condition becomes worse* other measures may have to be adopted and stones must be removed by the methods already described.

Large perineal openings with subsequent irrigations with permanganate, oxygen, or other solutions, may be required for retention of urine, especially when due to masses of blood clot or debris or soft masses of bilharzial tissue; and also in a very septic bladder, with or without extensive phosphatic concretions. When incontinence of urine is present, a large soft catheter should be tied in for some days and if not effective, a perineal section may give temporary relief.

Hard masses of tissue anteriorly should be cut into and the irregular sinuses traced down to the bladder or its surroundings. After the removal of as much bilharzial tissue as possible, the whole wound is left widely open to heal up from the bottom.

PLATE 62.

Fig. 1.—Author's tube introducer, especially designed for perineal cystotomy, and his catheter retainer.

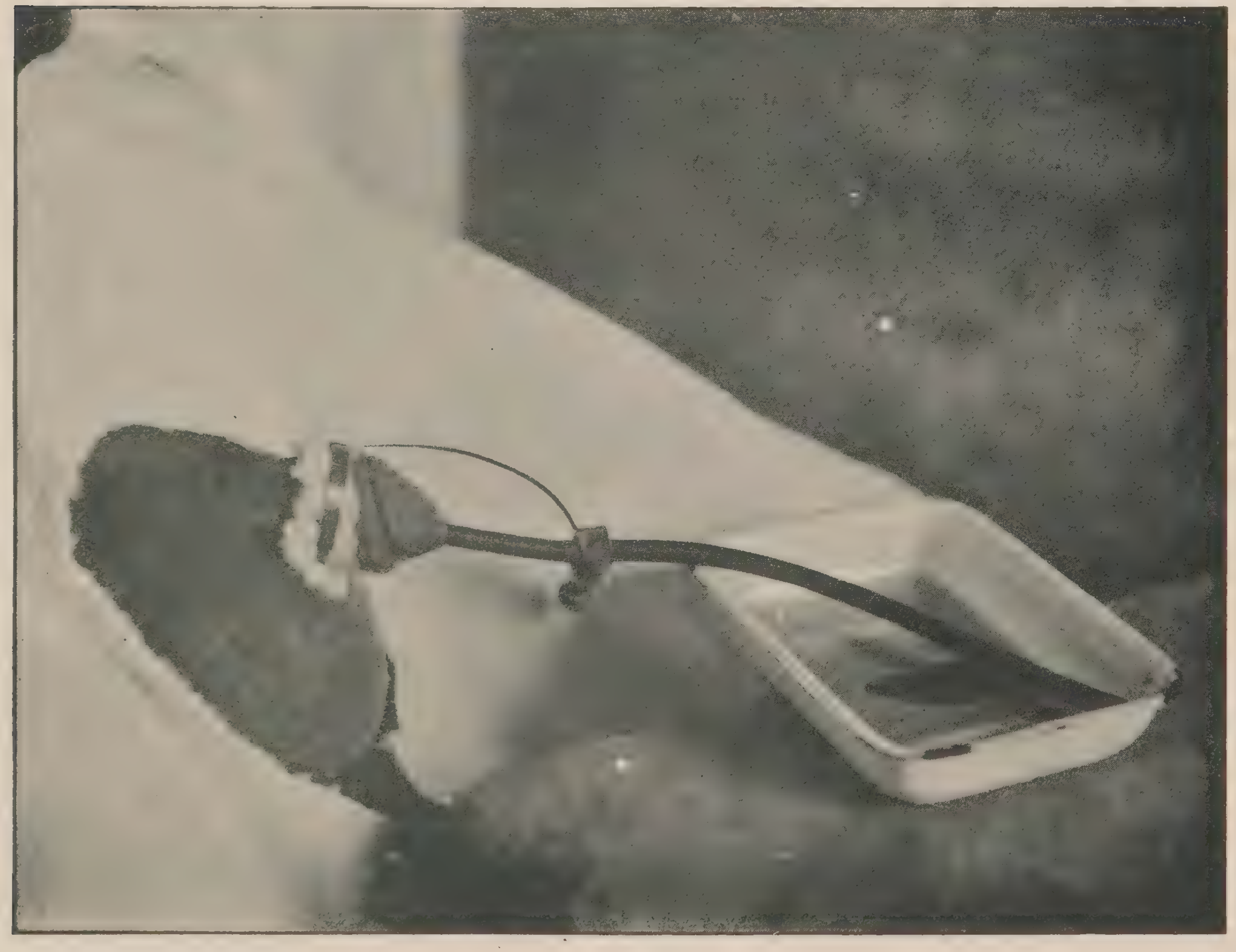


Fig. 2.—The catheter retainer in position. A strip of lint is folded round the penis just behind the glans, and the spring adjusted by a screw to the required size, a similar arrangement gripping the catheter as it issues from the urethra. No further fixation of any kind is necessary.

Finally, to relieve the dreadful suffering, often associated with the severer later phases of the disease, perineal drainage must be provided; but, as we have already seen, the temporary relief so afforded is but the beginning of the end.

Operations on the ureters and kidneys may be performed as symptoms and signs, indicated by the cystoscope or other methods of examination, demand; but they consist, in general, of the removal of phosphatic stones, the drainage of hydro — or pyonephroses, with or without nephrectomy, depending upon the state of the better acting kidney. In many cases both kidneys are equally badly effected and all operation is out of the question. All the finer plastic and other operations on the ureters and pelvis of the kidney can hardly find any place in the treatment of this very generalised condition.

Similarly, operations on the urethra, either for the early peri-urethral abscesses, or the later fistulae, are carried out on the usual principles, the essential point being that every scrap of bilharzial tissue must be removed to effect a lasting cure. In the case of an abscess the whole wall must be cut away and the opening into the urethra well scraped and the wound left widely open to granulate up. With fistulae, it does not matter what their extent or situation, great masses of tissue must be freely excised and not infrequently the scrotum must be divided in the middle line and large pieces of it completely removed. The fistulous tracks must be traced right back to the urethra from which they spring, whether they go up between the corpora or through the corpus spongiosum. Any tissue that cannot be removed must be thoroughly scraped clean of all soft bilharzial granulations and the cut edges of the urethra similarly treated. If the urethra is much thickened or obstructed, it must be incised and a catheter secured in the bladder for some days. For this purpose I have devised a *catheter clip* which is very useful and has already been described in the paragraphs on stone in the bladder.

Sometimes whole pieces of the urethra are destroyed and replaced by scar tissue, in which case an attempt must be made to re-construct a urethra from the adjoining tissues over a catheter, while drainage is provided by a tube passed into the bladder far back through an external urethrotomy wound. All the false elephantiatic tissue, often riddled with sinuses, must be ruthlessly cut away and the large raw surface grafted later.

In *bilharziosis of the penis*, a complete decortication of the organ by an incision straight down the dorsum should be practised, with secondary grafting. The operation affords great relief and in the doing of it the urethra and the fistulae must be appropriately treated. Should epithelioma supervene, a complete amputation of the penis with the affected glands must be promptly carried out. Nodules in the subcutaneous tissues or in the erectile tissue of the penis, and similar lesions in the spermatic cord must be removed, and in just the same thorough way as the much larger hard masses in the perinaeum or the scrotum. Bilharzial tracks, wherever they occur on the skin surface, must be completely excised whenever possible, and, if not, must be freely laid open and thoroughly scraped.

The treatment of *bilharzial lesions of the female generative organs* must be carried out on general principles. It consists in the removal of papillomatous masses wherever they occur, if they are giving rise to irritation or any unpleasant symptoms. Removal or scraping of subcutaneous deposits and cutaneous ulcerations may be required, and extensive removals of redundant or infiltrated vaginal mucous membrane.

Much of the above has been already published in my various articles on the subject and reference may also be made to the following :—

Looss. Article on Bilharzia in Mense's Handbuch der Tropenkrankheiten.

Madden. Bilharziosis. Cassell. 1907.

Day. The Blood changes in bilharziosis. Lancet, Nov.11th,1911.

Madden. The incidence of stone in Egypt. Lancet, July 19th, 1913.

Pfister. Beitrage zur Histologie der Agyptischen Blasensteine. Deutschen Zeitschrift fur Chirurgie, Band 121. 1913.

Ferguson. Associated Bilharziosis and primary malignant disease of the urinary bladder. Journal of Pathology and Bacteriology, Vol. XVI, 1911.

Ruffer. Bilharzia in Egyptian mummies of the 20th dynasty Brit. Med. Jour., January 1st, 1910.

Madden. Two interesting Bilharzial conditions. Lancet, October 23rd, 1909.

Madden. Bilharziosis of the penis. Jour. Trop. Med., Dec. 1st, 1909.

Madden. The incidence of bilharziosis in Egypt and its clinical manifestations. Brit. Med. Association meeting. July 1910.

Day and Richards. The treatment of bilharziosis by salvarsan. Lancet, Apl. 27th, 1912.

Clayton-Greene. Notes upon two renal cases. Lancet, Dec. 17th, 1904.

Pfister. Die altaegyptischen Penisfutterale. Deutschen Gesellschaft fur Urologie. 111. Kongress in Wien. 11—13 September 1911.

Madden. The incidence of bilharziosis in Egypt and its influence on the surgery of the genito-urinary tract. The Urologic and Cutaneous Review, St. Louis, U.S.A., Jan. 1915.

Madden. Article in Choyce's System of Surgery. Cassell. 1912.

SURGICAL DISEASES OF THE KIDNEYS AND URETERS.

As will have been gathered from the foregoing, bilharzial disease dominates the whole of our urinary surgery, but it must not be supposed that other more usual conditions are entirely absent. On the contrary, we have a full share of general renal experience ; but it will suffice here to make some comments of local interest, to supplement the account of these conditions found in the usual text-books. Thus, as elsewhere, we very

occasionally come across a case of HORSE-SHOE KIDNEY; and I have reported one case in which I had to remove a large hydronephrosis from one horn of such a kidney, a fatal result ensuing nearly a week later from insufficient blood supply to the remaining piece of kidney substance. MOVABLE KIDNEY is quite uncommon; but is sometimes diagnosed when the condition is really that of a distended and mobile caecum, associated with either chronic appendicitis and adhesions or intestinal stasis. Fixation operations are but seldom called for.

INJURIES TO THE KIDNEYS AND URETERS have nothing essentially Egyptian about them; but are possibly more common here than elsewhere, owing to the frequency of falls from a height or the collapse of unsafe buildings and houses.

CONGENITAL HYDRONEPHROSIS is rare; and though the acquired form is very generally of bilharzial origin, it sometimes happens that a calculus in some part of the urinary tract is responsible. A careful cystoscopic examination of the ureteral orifices is done in every case, and a nephrectomy is only performed if there is very clear evidence of jetting from the sound ureter and other signs of a functionally active organ. The presence of a certain degree of bilharzia in the bladder or the orifice of the ureter on the sounder side does not necessarily contra-indicate operation, which, indeed, is often followed by a very gratifying improvement in the patient's general health. The same rules of treatment apply to PYONEPHROSIS, which usually follows on a hydronephrosis only too quickly, especially if it is of bilharzial nature. Briefly, we practise nephrectomy — and always from the loin by a very free lumbo-abdominal incision — if the less diseased kidney is working fairly satisfactorily; but if it also is discharging pus into the bladder and is evidently, so to speak, an unclosed pyonephrosis, the worse kidney is incised from the loin and drained and may be subsequently completely removed; if the cystoscope shows subsequently that the better kidney has improved and the general condition of the patient indicates that the secretion of urine is well-maintained. In all cases there is a risk of complete suppression, whatever may be the state of the surviving kidney, but in such a desperate condition we must be prepared to take chances and in all cases careful judgment of the case in all its bearings must first be made and is not often at fault. Even if it means that a discharging sinus is left almost indefinitely in the loin, that is better than the former 'living death' from the constant absorption of toxic products from an old and increasing pyonephrosis. I operated on a case of this kind more than a year ago and he is now fit and well and doing all of his former work, his only inconvenience being a small discharging track in the site of his pyonephrosis drain. Yet I know that his other kidney is still discharging pus in his bladder, though in much less quantity than at the time of his operation.

In Egypt we can hardly imagine *pyelitis*, *pyelo-nephritis* and all the *other septic conditions of kidneys* and ureters, apart from bilharziosis and stone; but they may occur, though the acute condition from gonorrhoea or *B. coli infection* must also be recalled. Treatment follows the usual lines, depending primarily on the cause of the condition. So essentially is the treatment of these *bacilluric conditions* a question of vaccines, that I include here some paragraphs of a lecture on 'Vaccine treatment' I delivered during 1915 in the Medical School and published in the Lancet of August 7th 1915.

BACILLARY INFECTIONS OF THE URINARY TRACT, PARTICULARLY WITH BACILLUS COLI OR COLIFORM ORGANISMS.

"These cases are far commoner than is generally supposed, and in most instances it is almost impossible to trace the origin of the infection. The usual symptoms are an increased frequency of micturition, with considerable burning and irritation during and after the passage of the urine, with a peculiar characteristic cloudy appearance due to very fine granules suspended in the urine. One case may have ordinary cystitic symptoms, but others have in addition a series of rigors, with severe pain in the back and loins, somewhat relieved after micturition. There is generally a high septic temperature, and the urine may be loaded with pus when the disease is at its height. The diagnosis is made by a bacteriological examination of the urine and its subsequent culture. Not infrequently a pure, or almost pure, culture of bacillus coli is obtained. Various groups of coliform bacilli may also appear in the culture, and in making a vaccine these have to be considered and utilised in its preparation.

These cases are very difficult to treat without vaccines, but relief may be obtained, though the organisms may persist, by the use, first of all, of alkaline diuretic mixtures ; and, later, of acid phosphate of soda and large repeated doses of urotropin. In my experience, however, relief is only temporary, and a recurrence is almost inevitable. This may even be the case when a vaccine has been tried but only in a half-hearted way.

Women are particularly liable to infection, probably from accidental contamination of the urethra from the vagina or rectum, but men are by no means exempt. The urine is collected, after careful cleaning with sterilized water of the external genitals and meatus, either by catheter or by passing urine into a wide-necked sterilized flask. Every care is taken to prevent accidental contamination from without. Vaccines are then made on the usual principles and a very careful watch kept on the urine. After three or four injections a fresh cultur eshould be made, and, if necessary, a new vaccine ; and this may have to be done two or three times before a cure is obtained. After a good course of treatment everything should be stopped, and an entirely fresh examination made 14 days afterwards. Recurrences are common, and the only way to guard against them is to keep a regular watch on the urine and culture it frequently, till there has been a complete absence of signs or symptoms for at least a month.

In two cases, after a very vigorous treatment, cure appeared to have been attained when pregnancy occurred, and the condition recurred in a most virulent form a few days after the child was born. This is a very frequent occurrence and must be guarded against. Some degree of protection may be afforded by prophylactic doses of an ordinary stock bacillus coli vaccine during the later months of pregnancy.

In one patient, with marked cystitic symptoms, the first examination showed two different bacilli, thicker and larger than bacillus coli, and a vaccine was made from them. This was persisted in till no reaction occurred, but quite suddenly the original symptoms reappeared, apparently directly traceable to a dose of cascara which produced a violent action of the bowels. The examination of the urine now showed

lots of coliform bacilli and bacillus enteritidis. It was as though the stirring up of the organisms in the bowel also stirred up the dormant bacilli in the bladder. Improvement being, after this reawakening, rather slow with the original vaccine, a further examination was made and showed a pure culture of bacillus coli, obviously due to accidental infection, as a specimen two days later, under conditions that absolutely precluded the possibility of outside infection, was absolutely sterile, and so it continued. Since that time the patient has gone through her pregnancy and confinement without any sign of recurrence. It seems certain that the coliform bacilli were the true cause of the condition and they were eventually killed by their own vaccine, but not until 500 million (5 c.c.) had been given as one final injection.

One must always be on the look out for coli and coliform infections and I know of no better treatment than that by vaccines.

I have also seen this condition of infected bladder, ureters, and pelvis of the kidneys, after infection of the bladder by catheterisation during severe typhoid, and here an autogenous vaccine had a very good result. I cannot tell you the composition of this vaccine as it was made in London. A good result also followed a course of vaccines in a somewhat similarly infected urinary tract secondary to influenza.

To some extent also stock bacillus coli vaccine may be useful in cases of appendix abscess when, by the smell and other symptoms, the infecting organism seems to be bacillus coli ; and in cases of colotomy or other intestinal fistula, acquired or post-operative, it may considerably improve the appearance of the wound and add to the comfort of the patient."

Further reference to gonorrhoeal infections and vaccines has been made in a former section.

TUBERCULOUS DISEASE OF THE KIDNEY is very rare indeed in Egypt.

STONE IN THE KIDNEY is comparatively rarely met with while it is still in the pelvis, though its passage down the ureter in small pieces gives rise to quite a considerable frequency of renal colic, apart altogether from the very common symptoms of the same nature dependent upon the presence of bilharzia, in one form or other, in the upper part of the urinary tract. Thus, in a series of 312 cases of stone, I found there were only five operations for stone in the kidney (1. 6 %) ; and that, during five years, out of 655 admissions for stone to Kasr-el-Ainy, there were only 15 in the kidney, or just over 2 % of the total.

Similarly STONE IN THE URETER is very rare and often then only accidentally discovered as the causal condition of hydronephrosis, either with or without bilharzial infection in addition.

The signs and symptoms of uncomplicated renal and ureteric stone are as clear in Egypt as elsewhere and the valuable confirmative evidence often given by the cystoscope must not be neglected. The treatment, operative and otherwise, follows the usual lines.

Of TUMOURS OF THE KIDNEY we have some very perfect specimens of hypernephroma, sarcoma, diffuse cystic disease, and congenital hydronephrosis, in the Museum; but they, in common with other congenital and later-day tumours, do not differ from European standards, though they may have attained an extraordinary size before they have been removed, or reached the post-mortem table. Whenever removal is possible the anterior route is generally to be preferred.

I have never seen HYDATID CYSTS OF THE KIDNEY in Egypt.

All the finer operations on the ureters and pelvis of the kidney hardly ever have any chance in the presence of the universal bilharzial infections.

SURGICAL CONDITIONS OF THE BLADDER PROSTATE AND URETHRA. In considering all the different diseases of these parts we are again constantly overshadowed by bilharziosis, and must eliminate this disease before committing ourselves to any other diagnosis. In many respects, however, our diseases are essentially European and depending on purely mechanical or pathological causes, which operate in Egypt in common with most other countries; and we must endeavour to present the local features of these conditions and point out how the local incidence of disease influences them.

As with all CONGENITAL DEFORMITIES, extroversion of the bladder is of extreme rarity; but TRAUMATIC RUPTURES OF THE BLADDER are not by any means uncommon, as would be expected from the large number of accidents to pelvis, abdomen, and lower limbs treated in Kasr-el-Ainy. We have nothing to add to the European account of CYSTITIS, which may exist in all the various forms, which, however, are almost lost sight of amidst the innumerable cases due to bilharzial infection. Stone, gonorrhoea, dirty catheterisation, and bacilluria, are the most common extra-bilharzial varieties. TUBERCLE OF THE BLADDER is only seen in the form of rather large miliary tubercles and early ulceration, secondary to tuberculous disease of the epididymis and spermatic cord; and with these may be also a small softening tuberculous nodule in the substance of the prostate on the same side.

TUMOURS OF THE BLADDER for us mean bilharzial papillomata in different grades of severity and bilharzial formations generally; and the only common form of *cancer* is that grafted on to an old bilharzial infiltration of the bladder wall. I have seen, however, two cases of quite extensive pedunculated papillomata of the bladder which were not bilharzial in nature, and several cases of cancer secondary to or primary to an enlarged prostate. In advanced malignant disease of the bladder, from whatever cause, one does not hesitate to provide temporary, but nevertheless very effective, relief to the distressing symptoms by a median cystotomy drainage through the perinaeum.

Of FUNCTIONAL DERANGEMENTS OF THE BLADDER nocturnal incontinence appears to be quite uncommon, due in large part, I think, to the practice of circumcision, which is universally practised by the Mohammedan peoples. It is interesting to note that this practice was an Egyptian rite many centuries before it was adopted by Moses as a tenet of the

Jewish religion. The adult forms of INCONTINENCE in Egypt are almost invariably bilharzia-produced, the general pathology being a gradual infiltration of all the coats of the bladder, muscular as well as mucous, and, later, the transformation of the muscular fibres of the sphincter into bilharzial fibrous tissue. Thus the organ, losing its contractility and being no longer elastic, cannot act as a reservoir for fluid of any kind and so allows the constant dribbling of urine from the urethra. In certain cases also the tumour formation and the dense fibrous infiltration of the walls of the bladder become so marked, as the bladder cavity becomes so contracted and its capacity so restricted, that a false incontinence, really a partial overflow, occurs and persists. Apart from bilharzia, functional incontinence and distention with overflow, present themselves and claim the same essential causes as in European countries. It is surprising, however, to European eyes, how few cases come to hospital with RETENTION OF URINE. With the exception of an occasional prostate with retention, and a rare stone impacted so tight in the urethra as to occasion retention, the ordinary run of English hospital 'retention of urine' cases are conspicuous by their absence. Stricture of the urethra after chronic gonorrhoea is very rarely met with ; and, though bilharzia may produce tremendous destruction of the urethra with blocking, the urine seems to get away somehow, largely by numerous fistulous tracks, and it is only very late indeed in the process that a patient is compelled to seek advice owing to his inability to pass his urine. Probably the most common cause of retention of urine here is stone in the neck of the bladder or the urethra ; and even then the patient often prefers to wait until extravasation of urine has been produced. I have recently had a case in an old man in whom retention was due to a series of almost impermeable strictures in the urethra, probably the result of an old urethritis, and which subsequently yielded to treatment by steady dilatation with sounds and catheters. This case is, however, quite an exception. For this reason also we rarely see non-bilharzial atony of the bladder, except as part of an enlarged prostate syndrome.

We have nothing essentially local to add on the subject of URINARY DEPOSITS, though one naturally expects some variations from standard in an almost essentially vegetarian population. These differences are, however, almost physiological and directly dependent upon the diet ; but they do not exercise much appreciable pathological effect on the urinary secretion. Similarly, stones of all the commoner compositions are found and are dealt with as described in the preceding sections.

AFFECTIONS OF THE PROSTATE. With the comparative infrequency of complications from gonorrhoea, acute, and also chronic, prostatitis is correspondingly rare ; and when it does occur it presents no peculiar features. Tuberculous disease too, except in the form of a nodule secondary to tuberculous epididymis, I have never seen ; and prostatic calculi are equally rare.

ENLARGED PROSTATE. A very large proportion of old gentlemen in Egypt grow to a ripe old age without being conscious of their prostate, beyond a certain increased frequency of micturition which they naturally ascribe to advancing years. In 1912 and 1913 there were 19 and

17 cases respectively ; and in our experience several of the cases admitted as such turn out to be bilharzia of the bladder and not prostate at all. Sometimes, after supra-pubic exploration, a small hard fibrous prostate may be felt beneath a thickened and infiltrated mucous membrane; and, at other times, a deep post-prostatic pouch is discovered, with very little if any enlargement of the prostate. In the early stages of bilharzial disease, the prostate may be infiltrated and so produce a considerable proportion of the early irritable effects at the neck of the bladder ; but as the disease progresses it seems to make for contraction in the prostate and not for enlargement. It is unfortunately common, however, to find an enlarged fibro-adenomatous prostate covered by a thickened soft infiltrated mucous membrane ; and, though one is often tempted to perform prostatectomy in such cases, the prognosis is not good, or, at any rate, is very uncertain, owing to the general bilharzial infection of the whole urinary tract. Naturally, when the bilharzial infection is at all advanced within the bladder, enucleation of the enlarged prostate is entirely contra-indicated. Symptoms resembling those of enlarged prostate are sometimes found to be due to a thickening of the whole extent of the bladder walls just above the site of the prostate, on its posterior wall. These cases are early cancer, bilharzial in origin, and are best treated by closure of the bladder without drainage.

In a bladder in which the bilharzial infection vents itself especially on the walls of the bladder below the mucous lining, many queer pouchings and pockets may be formed, especially in the lower third of the bladder; and, as the patient gets older, a very slight enlargement of the prostate may, in combination with its surrounding pouches, give rise to marked symptoms, the true explanation of which can only be discovered on exploration of the bladder.

We are always careful, therefore, of committing ourselves to an absolute diagnosis of uncomplicated enlarged prostate; and, partly for this reason, as well as the necessity of doing so on account of dirty urine, we nearly always operate in two stages, the preliminary suprapubic drainage opening serving the double purpose of confirming our diagnosis and of acting as a drain, so to relieve any general urinary tension and to allow us to clean the urine and bladder by appropriate irrigations, preferably by Janet's method through the urethra, as well as through the tube itself.

I performed the first prostatectomy in Egypt by Freyer's method in 1902 and since that time have had many opportunities of practising this operation. Many cases do well, but the prognosis almost entirely depends on the presence or absence of bilharzial infection in the urinary tract. In general we do not do the operation if we know bilharzia is present ; we almost always make a preliminary drainage and irrigation of the bladder through a supra-pubic opening before enucleation; we follow Freyer's principles of after-treatment in the main; and get our patients up out of bed as soon as is possible. I have seen no bad operative complications recent or remote. Cancer of the prostate we leave severely alone and do not attempt its removal ; partly from the almost impossible task imposed by the operation, but mainly because of its association with bilharzial cancer, which may have originated in the lower pole of the bladder and involved the prostate in its spread and infiltration.

Perineal prostatectomy has only been done on very rare occasions and has hardly any place in our list of operations, owing to the uncertainty of our diagnosis.

The various CONDITIONS THAT ARISE IN THE URETHRA occur quite irrespective of the nationality of the patient; but in Egypt congenital deformities are as rare as in other parts of the body; impacted calculus is common, but it is very unusual to find any other foreign body in the urethra; and stricture, apart from the ravages of bilharzia, is exceedingly rare. Reference to all these and other conditions of the urethra must be made in the usual text-books, while remembering that the two commonest troubles in the Egyptian urethra result from bilharzia or stone, or both combined. The various grades of severity of bilharzial urethral fistulae and its effects upon the penis, scrotum, and adjoining parts, must be studied in a preceding section.

The Egyptian PENIS is subject to most of the ordinary European troubles, but the Mohammedan population, who form the large majority of the people, are very conspicuously exempt from all the unpleasant consequences due to an elongated fore-skin. Circumcision is done at an early age, about seven years, often with much ceremony as befits an operation so surgically beneficial to the growing boy.

The following account of the operation of Circumcision as practised in Egypt at the present day has been written for me by Dr. Ismail Diay, Assistant Surgeon to Kasr-el-Ainy Hospital:—

CIRCUMCISION is an operation with which a doctor working in Egypt ought to be thoroughly acquainted, as every Mohammedan or Jew is circumcised during his childhood. The Copts who live in the country villages and small towns are generally circumcised also; those living in large towns do not follow this custom to the same extent, although many of them have the operation done as adults for some reason or other. Some years ago it was one of the most paying operations for the surgeon, and as much as £ 300 and even more has been paid for a circumcision.

In the villages, barbers generally do it, and septic results follow in many cases. The Department of Public Health has now arranged a regular yearly course at Kasr-el-Ainy for training the barbers, particularly in matters of surgical cleanliness, the technique of the operation of circumcision, etc.

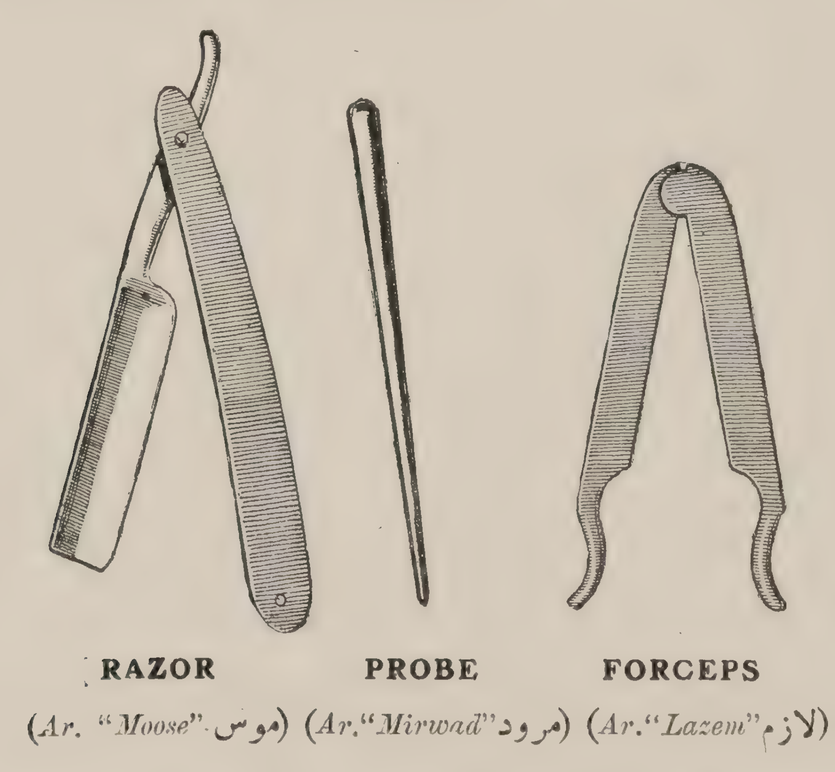
It is unnecessary to insist upon the advantages of circumcision in hot climates such as ours; it may be sufficient to mention that if such a functionless piece of skin and mucous membrane is got rid of, it will remove a pouch in which the presence of smegma and organisms may be a cause of trouble. Also the treatment of venereal diseases is much facilitated by its absence; indeed this operation is always advised for the uncircumcised when he has sores on the prepuce, phimosis, or paraphimosis.

Age. It is very rare to meet a Mohammedan past his fourteenth year with a prepuce. Jews circumcise their children when they are seven days old — a time when the healing power of the tissues is at its highest-the result being a cure in three days without having to insert any stitches at all. For Mohammedans the usual age is 2-8 years, twelve being the maximum. It is only in Christians that the operation is done in adult life.

Anaesthesia. When the child is under 2 years of age, the operation is done without any anaesthetic. The procedure is so quick and the child is so easily held that it is not necessary to make the child suffer from the after-effects of chloroform. At any age above that, chloroform is given, unless the patient—if we have the right to call him so—is full-grown and prefers local anaesthesia, when an injection of 1 °/₀ cocaine with a few drops of adrenaline around the base of the prepuce is quite sufficient.

Operation. In operative surgery books different ways of circumcision are mentioned; but they are all very seldom done as compared with the almost universal practice of the Egyptian operation. From old days, and even now, the operation is being done by barbers. It is from their method that the surgeons have learned the operation and have only improved on it in instruments and technique. It gives the best possible results.

The instruments required for the operaton are:—(a) Circumcision forceps (Ar. "Lazem". لازم). This is made of two flat blades with a hinge at one end. The blades are convex on one side and concave at the other, and end at the free end in two small semilunar projections for holding. (b) A probe (Ar. "Mirwad" مرود) which is conical in shape, blunt at one end and much thicker at the other. (c) A sharp metal-handled razor or a long-bladed knife. (d) Scissors. (e) A toothed forceps. (f) Artery forceps. (g) A small round needle and a piece of thin catgut.



RAZOR (*Ar.* "*Moose*" موس) PROBE (*Ar.* "*Mirwad*" مرود) FORCEPS (*Ar.* "*Lazem*" لازم)

We distinguish three different kinds of prepuce, for which the operation varies.

1. The ordinary prepuce which can be easily retracted over the glans. Having got everything surgically ready, and standing on the right of the patient, the skin of the penis and pubis is painted with 1 ¼ °/₀ iodine solution. (This is prepared by diluting the ordinary iodine solution with an equal quantity of alcohol.) The prepuce is then retracted over the glans and the mucous membrane painted with the same solution, at the same time the smegma—a sebum-like material—is removed. In many cases the deep surface of the prepuce is adherent to the glans. This must be separated but must never be done by force. The tip of the probe will

be found very useful in making this separation. The tip of the probe is then put at the point of reflection of the mucous membrane on the dorsal aspect, and the prepuce pulled over it. The prepuce and probe as a whole are pulled down beyond the glans. The "lazem" is then applied to the prepuce between the glans and the tip of the probe with its convex surface forwards and closed tightly, taking great care not to include the glans. The direction of the "lazem" must be from above downwards and forwards. This leaves an angular piece of skin on the under surface. The probe is now put aside, the "lazem" is held by an assistant and beginning with the heel of the razor or knife the prepuce is cut in one sweep at the convex surface of the "lazem". The cutting instrument is kept in contact with the "lazem" all the time, thus "shaving" the prepuce from the "lazem". When this is done the skin retracts from between the blades. The mucous membrane, now lying on the glans, is turned back and stitched to the retracted skin. Four sutures or more are inserted, the most important being the one on the under surface joining the angular piece of skin to the fraenum.

Haemorrhage occurs generally from the vessels to the fraenum. This is very easily stopped in young children by pressure between the fingers before inserting the sutures; whilst in older children twisting the vessels by an artery forceps or applying a ligature may be necessary.

The best dressing is sterilized vaseline on a piece of gauze, which has to be changed in two days time if it gets soaked with urine. Collodion dressing is bad, as it dries on the delicate mucous membrane and may cause ulcerations.

As the sutures are made of fine catgut, they may come out by themselves, or be taken out on the seventh day and no more dressing put on the wound.

2. When phimosis is present. In these cases the prepuce can not be retracted over the glans. The operation is commenced by cutting the prepuce at its orifice on the dorsum aspect by means of a pair of sharp-pointed scissors. This enlarges the opening and the prepuce can then be easily retracted and the operation is completed as the above.

3. In some cases the prepuce is disproportionately small and does not cover the glans. In these cases the common people believe that the child has been partially — sometimes completely — circumcised by the angels. In these cases if the prepuce is long enough to proceed as in operation 1, it is done in that way. If not, then a trimming operation is done as follows. This way of doing a circumcision may also be followed in any case. The prepuce is held at its tip by two artery forceps, one on either side of the orifice. Pulling the prepuce downwards by these forceps, a longitudinal cut is made along the dorsal aspect through its whole thickness to the reflection of the mucous membrane by straight scissors. The scissors are then carried laterally and the prepuce is cut in the line of the reflection of mucous membrane to the fraenum. The same is done on the other side, taking great care to leave an angular piece of skin on the under surface at the fraenum. Haemorrhage is stopped as above mentioned and sutures made.

CIRCUMCISION IN THE FEMALE. This really means the amputation of the clitoris, with cutting of the labia minora. I shall briefly describe the operation.

With the girl in the lithotomy position under a general anaesthetic, an assistant separates the labia majora with his fingers. A curved incision is made on the dorsum of the clitoris transversely, cutting into the labia minora on either side thus exposing the body of the clitoris. A similar incision is made on the under surface meeting the former at the edges of the labia minora. The mucous membrane is then reflected backwards and as much of the clitoris is exposed as possible. The clitoris is then crushed and ligatured, cut off in front of the ligature, and removed with the attached mucous membrane. The mucous membrane is then sutured together transeversely with thin catgut, and treated as all wounds in this situation.

Bilharzia, again, is responsible for much deformity and destruction of the penis, as has been already related; and, apart from the very obvious manifestations associated with fistulae and a false elephantiasis, the occurrence of hard fibrous masses in the body of the erectile tissue in either of the corpora must not be overlooked. These masses are irregular in size and shape and often produce much distortion of the organ, especially when in a condition of erection. In the later stages of the disease this fibrous infiltration becomes so diffuse and hard as to give rise to a permanent distorted erection, which adds one more misery to the already lengthy list of tortures to which these miserable beings are subject.

EPITHELIOMATOUS ULCERATION also is generally secondary to an old bilharzial ulceration about the glans and meatus, and soon involves the glands in the groin and in the iliac fossa. Nothing but an early and very radical amputation of the penis and the removal of the infected glands is of any avail in this condition.

It must be remembered that the average penis, and, correspondingly also, the urethra, of the Egyptian fellah is often of surprising proportions; and the conventional European lengths of catheters and other urethral and bladder instruments are often all too short for the hard-working fellah. This excessive size of the penis among Egyptians of this class is especially marked in the older men with a developing prostate.

DISEASED CONDITIONS WITHIN THE SCROTUM. A large proportion of our out-patient work in hospital has to do with the scrotum; but there are considerable differences in Egypt compared to European practice. Thus, hernia and hydrocele are very prevalent, congenital anomalies of the testis are rare, as are also the after-effects of gonorrhoea; the place of these being taken to some extent by funiculitis, bilharzial masses in the cord, fistulae, and other bilharzial manifestations.

It will be better to consider the various conditions in definite order and point out local peculiarities as they occur.

As regards CONGENITAL ANOMALIES OF THE TESTIS we *do* occasionally find an undescended or a partially descended testis, and have even seen the testis in the perinaeum or on the front of the upper part of the thigh, but these are so rare as to be quite curiosities.

The various INJURIES OF THE SCROTUM and its contents are naturally quite common.

HYDROCELE. This condition is very common in Egypt and, on an average, just under 100 cases are admitted to Kasr-el-Ainy every year. This does not in any way represent the number who apply for treatment, as we are quite unable to spare further beds for all the applicants with this disease. All degrees of swelling are met with and some assume enormous proportions; and nearly all do not seek advice until they have attained a size hardly ever seen in the more civilised European races. In general, all the usual signs and symptoms are evident but, with the very much thickened sac so commonly present, translucency is not always easy to obtain.

The *differential diagnosis and the proper methods of examination of all scrotal tumours* can only be acquired by actual examination of cases in the out-patients and the wards, and by studying the numerous books on clinical examination at our disposal; but we are accustomed to teach the practice of a regular routine examination on the following lines.

With the patient standing in front of the examiner, a careful *visual* examination is first made; and, as with all other methods of examination, the apparently healthy side is first studied, to serve as a standard with which to compare the abnormal appearances. In this way, the actual size of the scrotum generally, and of its separate sides, will be seen, and also the colour of the skin, its tenseness or its corrugations; dilated superficial veins; the shape and contour or irregularities of the swelling; and the neck of the scrotum, whether free and rounded, or running on directly continuous with the skin of the groin or lower part of the abdomen. Any other obvious abnormalities, either in one or both sides of the scrotum, will be naturally observed by this careful "look", which must always precede any other form of examination.

The actual examination is now commenced by *feeling* the healthy side from the bottom of the scrotum upwards. First the testis itself is examined, noting if it can be well defined or is indistinctly felt, from the presence of fluid in the tunica vaginalis in front of it; then the epididymis in all its contour; and so on to the vas deferens and the spermatic cord, particularly noting any thickness or irregularity of the vas and any general or partial enlargement of the other structures of the cord, especially the veins.

When the cord has been traced up as far as the external ring, the patient must be laid down, a fold of skin from the middle part of the scrotum invaginated on the tip of the index finger, and pushed upwards and outwards into the external ring which is thus well defined and examined. While in this position the patient is made to cough to ascertain whether there is any impulse. At the same time the size of the ring is noted, and the general strength of the lower part of the abdominal wall.

Having thus obtained a true standard of the normal or less abnormal side, the same method of examination is followed on the abnormal side, and by this systematic investigation it is unlikely that anything of importance will be missed. Thus the size, the shape, the surface, and the weight of the testis will be determined (the thickness of the skin being incidentally noticed also); the presence of a hydrocele in front of the testis discovered, as well as any of the various conditions, such as orchitis, syphilis, new growth, or cystic degeneration, which may lead to an enlargement of this structure. The epididymis is then gone over in the same careful way and the presence of inflammation, acute or chronic, tubercle, early or advanced, revealed. Tracing up along the cord we must be on the look-out for inflammation of the vas, acute or chronic, thickenings or nodules from tubercle, varicocele, lymphatic varicocele or lymphocele, irregular bilharzial masses in the substance of the cord, knots of thrombosed and thickened veins, or hydrocele of the cord ; and when the whole cylinder of the cord is involved in one column of thickening, funiculitis must always be remembered.

If a swelling is present in the scrotum, an attempt must be made to encircle it above and so decide whether it has a definite neck and is confined to the scrotum entirely, or whether it runs straight on without much interruption into the abdomen. With the patient lying down, whenever it is possible, the finger must be invaginated into the external ring and an effort made to elicit an impulse. This is only possible when the swelling can be reduced into the abdomen, which is done by placing the patient on his back, with the shoulders raised, the thighs bent on the abdomen, and the knees flexed. The neck of the swelling is then gently fixed between thumb and first finger and reduction attempted by pressing upwards and outwards with the other hand. Too much force or time must not be wasted in trying to reduce a supposed hernia; and before attempting any reduction the swelling must be percussed, and valuable information is often thus obtained. A hydrocele or haematocele will naturally give a dull percussion note, as will also a hernia containing much omentum, while the typanitic note is very characteristic of a hernia containing gut without omentum.

Finally, to confirm the diagnosis of a possible hydrocele, an attempt must be made to obtain translucency ; but, from the thickness and almost calcification of the walls, this is not easily elicited in hydroceles of long standing.

Further, in all doubtful cases of scrotal swellings, the glands in the groins and those deeper in the iliac fossa must be carefully palpated for evidence of possible secondary infection ; and in all examinations of the scrotum, the penis must be included and may often contribute important evidence.

Causation of hydrocele. In spite of our peculiar opportunities in Egypt, owing to the frequency of this condition, we have not made much progress in discovering the cause of hydrocele ; and much that I wrote some years ago in the Edinburgh Medical Journal for March 1903, in a paper on the "Etiology and treatment of hydrocele," still holds good.

"It may be considered rather a reproach that, in spite of the extraordinary prevalence of hydrocele of the tunica vaginalis in Egypt and India, so little has been done to solve the vexed question of the etiology of this condition. So far as I am aware, except a 'not proven' statement that hydrocele is always an accompaniment of filariasis, no convincing evidence in favour of any one causal condition has yet been adduced. It has been affirmed that 'the lax and pendulous scrotum' common to the inhabitants of tropical countries predisposes to hydrocele; but that this is not all is, I think, proved by the fact that Europeans born in Egypt and living here all their life are not more prone to hydrocele than the inhabitants of colder climates, Scotland, for example; whereas a very large proportion of the native Egyptians suffer from this disease. It must be remembered, however, that the trousers and close fitting drawers worn by Europeans in Egypt, as elsewhere, provide a constant support to the scrotum, a support that is entirely lacking in the case of the Egyptians — and of the 'fellah' in particular — who is accustomed to wear nothing but a pair of very loose cotton drawers under their flowing 'galabeah' or overall. I should be inclined, therefore, to consider the absence of support a more important factor in the etiology of hydrocele than the condition of the scrotum *per se*.

Another factor which I believe to be of far greater importance in this connection is the almost universal habit of sexual excess which exists among the poorer inhabitants of Egypt — particularly among the fellaheen, who are most liable to hydrocele — and of other Mohammedan countries generally. It appears to me reasonable to infer that, as a result of the almost constant over-vascularity of the testis, and the contents of the scrotum generally, so induced, a considerable degree of over-fulness of the vessels occurs, leading to an increased serous effusion from them. (A similar condition is seen frequently around chronic ulcers of the lower extremities.) If this condition is present in the serous lining of the tunica vaginalis, the effusion will collect in the ready-made cavity and will go on accumulating, as re-absorption is rendered difficult by the constant stream flowing from the blood-vessels in the opposite direction. The tendency, therefore, will be towards increase in the amount of fluid effused. One of the functions of the lining membrane of the tunica vaginalis is to provide sufficient serous fluid to allow of the smooth sliding of the visceral upon the parietal layer, and so permit the active movements of the testicle within the scrotum to take place without the least difficulty or friction; but owing to the increased vascularity of the serous lining by the frequent repetition of the sexual act, the supply of fluid is constantly in excess — in short, the lining membrane does more than Nature expects of it — and the accumulation of this fluid constitutes a hydrocele, which persists owing to the continued action of the exciting conditions and the difficulty of re-absorption as before mentioned.

Quite apart, however, from the results of sexual excess, the over-vascularity of the scrotal contents may be determined by the mere hanging of the scrotum without support, and also by the congested condition of the parts from the difficulty of venous return. The latter feature becomes even more evident when, as frequently happens, the hydrocele is complicated with varicocele, which tends to increase the size and weight of the scrotum still further and thus to make it even more pendulous.

It is a noteworthy fact also that, in Egypt, horses mules and donkeys are frequently the subjects of hydrocele. This may be further evidence in favour of its formation from the want of support of a lax and pendulous scrotum, but it also introduces the question of the possibility of a common cause for men and animals, which is too vast a subject to discuss here. It would be interesting, however, to compare the frequency of hydrocele in animals in Egypt with European countries; but certainly in France, where, as in Egypt, the horses are rarely castrated in early life, I have not noticed any such obvious cases of hydrocele as in Cairo.

Though, from an etiological standpoint, hydroceles depending upon syphilis and other diseases of the testicle are in a separate class,as regards their treatment, I am of opinion that syphilitic hydroceles should be treated locally in exactly the same way as hydrocele from other causes.

On more than one occasion I have organised a search for filaria among the cases of hydrocele in my wards, the blood of the patients being examined sometimes at night and at other times during the day, but always without success. I have also had the hydrocele fluid examined, but no filaria were ever found, except in one obvious chylous hydrocele. One sometimes finds filaria in the blood of a patient who happens to be suffering from hydrocele ; but Dr. Hayward, who was good enough to make these investigations, informs me that he has never been able to satisfy himself that filaria is a cause of simple hydrocele of the tunica vaginalis.

The collections of fluid in the tunica vaginalis in elephantiasis of the scrotum — which probably is originally due to filaria, though at this stage no worms are to be found in the blood—are of a different nature to those of simple hydrocele, and are probably only an incident in the general series of changes known as elephantiasis, which involve all the tissues, cutaneous as well as deep, entering into the formation of the scrotum and its contents. Occasionally, however, it must be noted that a simple hydrocele is found in such cases, but this had probably existed before the elephantiasis developed, and had thus always been entirely independent of it.

Cases of true *chylous hydrocele* occur from time to time but come under an entirely different category. The only treatment to be advised for such a condition is periodic tapping, as I always look on this accumulation of fluid as a 'safety valve', and do not recommend any radical operation which will obliterate the cavity of the tunica vaginalis.

It is hardly necessary here to detail the *signs and symptoms* of hydrocele, except to insist once more on their large size in Egypt. The walls of the sac are often exceedingly thick and the serous surface rough and irregular with calcified plates, or thrown into thickened elevations. The fluid is often full of cholesterine crystals.

HAEMATOCELE is not common, and, when it does occur, it is either the result of a severe recent injury, or more often a haemorrhage into a pre-existing hydrocele. In old cases the sac may be filled with masses of softening blood clot in various stages of degeneration. Some have already

become purulent, and in all of these chronic cases the testis is very much pressed upon and may be quite atrophied. The extraordinary weight of a swollen scrotum is all in favour of haematocele.

Considerable dragging occurs in all large hydroceles and quite a long neck may be caused, dividing off the swollen scrotum from the inguinal region, and, very frequently, a hernia has developed also.

Suppuration may occur from septic infection from tapping or from infection of effused blood-clot within the tunica; but the possibility of acute funiculitis being in some way responsible for suppuration within the scrotum must always be kept in mind.

The *treatment of hydrocele of the tunica vaginalis* should be operative unless there is some very good reason against it.

In infants and young children simple *aseptic tapping* may be sufficient to effect a cure. In older children and in adults the practice of tapping and subsequent injection of the tunica vaginalis with caustic fluids has been much extolled; but I cannot think this method can be expected to be of any avail as a radical treatment of an average *Egyptian* hydrocele, not only on account of its size but also because of the thick indurated leathery walls of the cavity. It is only when the case is seen quite early, in a young subject, that injection should even be considered as a possible means of treatment. The method of injection is as follows:– With all aseptic precautions the hydrocele is tapped, the fluid withdrawn through a large cannula — one cannot inject a hydrocele sac thoroughly through a tiny tube — and the tunica vaginalis injected with a 5 % iodine solution in rectified spirit, or carbolic acid, 1 in 5 in glycerine or in spirit, or even stronger. The scrotum is then gently squeezed and kneaded to allow the fluid to come into contact with all parts of the sac. The quantity injected varies with the size of the hydrocele, but, if possible, the whole of the lining membrane must be smeared – so to speak — with the fluid. The excess flows away from the puncture, which is then closed with a piece of sterilized wool or gauze and collodion. The scrotum is placed in a suspensory bandage and rest enjoined for a few days. One of our difficulties in Egypt is to procure a suspensory bandage nearly large enough to carry an average hydrocele, eloquent testimony to the unsatisfactory result likely to follow the use of injections. Usually, a good deal of inflammation is set up; but this is far more often an orchitis or epididymitis than an adhesive inflammation ending in the glueing together of the walls of the hydrocele sac.

In my experience, which, it is true, is small in this respect, the result too often is a severe inflammation of the testis or epididymis, or even of the connective tissue of the scrotum, which takes some time to subside, while the hydrocele gradually fills up again and is very soon larger than ever.

In patients in a feeble state of health, who are suffering pain or distress from their hydrocele but who cannot be submitted to the risks of an anaesthetic, I should advise simple tapping, repeated as often as necessary, without any subsequent injection.

All cases of hydrocele should be treated by *radical operation*, and the operation I am in the habit of performing consists in making a free vertical incision, with all aseptic precautions, in the neck of the scrotum; the tumour having been pushed up nearly to the external ring by an assistant, who also keeps the skin of the scrotum tightly stretched. It has been advised to push the tumour up even higher and to make the skin incision in the inguinal region; or to push it back towards the anus and have the skin wound altogether in the perineum, with the idea, in both instances, that the wounds heal better; but I have never found any difficulty with the healing of scrotal wounds, provided the edges are brought into accurate apposition with clips, and I think these far-away incisions only unnecessarily complicate the subsequent steps of the operation.

The skin incision is deepened in its whole length until the thick sac is exposed, and, after any bleeding points have been secured, a puncture is made with a scalpel and the fluid evacuated. The opening into the tunica is then enlarged with scissors and the whole of the contents of the scrotum lifted out of the skin incision, after separating the thin layers of fascia with the fingers or the handle of the scalpel, a few touches of the knife being sometimes necessary to divide any thicker bands.

The whole of the tunica vaginalis, including often an elongated pouch running up almost as far as the external ring, is removed, with the exception of a flat plate behind, covering the testis the epididymis and the lower end of the spermatic cord. The thin fascia superficial to the tunica vaginalis must be saved, being separated off from the thick sac quite easily, to provide a soft connective tissue protection for the testis in front, in place of the fluid pad to which it has become accustomed. The tunica must not be cut too close to the testis or epididymis laterally or troublesome oozing will occur from the cut edges. After ligaturing any bleeding points and making quite certain that all oozing had ceased, the testicle is returned to the scrotum and placed well to the posterior aspect of the cavity so as to allow the divided subcutaneous and dartos tissues to lie in front and provide some degree of protection from possible injury. If oozing is troublesome the whole cavity should be swabbed out with very hot normal saline solution, which is usually very effective.

Of late years we have almost entirely given up this method in favour of what was formerly known as the 'Indian method', which we find much quicker to do and not so liable to give trouble from oozing or haemorrhage.

The incision is made as above, the tunica incised in its upper part and only sufficiently to allow it to be turned inside out, so that the testicle presents in front and the edges of the sac encircle the epididymis and cord behind. To effect this the unopened sac with the testis must be well separated from the surrounding dartos tissue and pushed right out of the wound. If this separation is not done there will be a difficulty in returning the testicle into the scrotum to complete the operation. The cut edges of the sac are usually brought together by a single catgut suture which is tied behind the cord. Hardly any oozing results from this operation and before the skin is sutured it must be seen that the testicle lies comfortably within the scrotum, and, in some cases, it may be

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Fig. 1.—Hypernephroma of the kidney. Path. Museum.



Fig. 2.—Right hydrocele and left haematocele.



Fig. 3.—Hydrocele of the tunica vaginalis. P.A.



Fig. 4.—Right haematocele and left hydrocele.



Fig. 5.—After-treatment of hydrocele operation ; scrotum supported on scrotal shelf, and an ice-bag, suspended from a cradle, resting on scrotum. Another scrotal shelf is placed beside the patient.



Fig. 6.—An abdominal hydrocele. The swelling in the lower part of the abdomen extending over to the other side as far as Poupart's ligament is well seen; but the upper part is unfortunately cut off in reducing the size of the photograph.

necessary to make a nest for it by introducing the two index fingers and excavating a cavity by parting the loose dartos tissue. This operation cannot be satisfactorily done if there is a large amount of redundant sac. In this case, either a lot of the sac is cut away and the first mentioned operation done, or a portion of it is removed and the rest folded back behind the cord and fixed there by a catgut suture through the cut edges as just described.

The *after treatment* of an operation for hydrocele consists in keeping the patient lying on his back, with the scrotum raised on a thin wooden scrotal shelf, which is simply a flat board with a bite out of it like a barber's basin. The wound, which has been painted with iodine after the application of the clips, is now covered with a single thickness of sterilized gauze, and an ice-bag suspended from a cradle and allowed to lightly rest on the scrotum for from three to six hours, to prevent oozing and also to check the onset of orchitis. This procedure has proved very successful at our hands and the ice may be applied at intervals for the first 48 hours, after which time a piece of dressing is placed over the wound, which is itself painted with iodine daily. The clips are removed on the fifth day, the shelf removed, and a loose linen suspensory bandage applied. The patient gets up in from 8 to 10 days and goes out in 12 to 15, with a properly fitting suspensory bandage which he has to wear for at least a month.

Should the hydrocele be excessively large, the greater portion of the lower half of the scrotum is completely removed, by means of two incisions diverging from the original one in front and meeting again behind, at a point corresponding to its upper end. A new aud smaller scrotum is then formed by bringing the cut edges together with a series of interrupted silkworm gut sutures, which include the whole thickness of the scrotal tissues, with clips to approximate the skin. A drain may be placed in the lower end of the wound if necesary.

If the *oozing* has not been entirely stopped before the wound is closed, there will almost certainly be a considerable passive haemorrhage into the scrotum a few hours after the operation. In this event the wound must be re-opened and the bleeding points secured, if possible, or very hot water employed to check the oozing. This secondary bleeding very much increases the risk of subsequent orchitis and sepsis.

If *orchitis* occurs, and it must be admitted there is a varying degree of inflammatory reaction of this nature in almost every case, the course of treatment, if the ice-bag does not check it, is rest, elevation, hot applications, especially antiphlogistine, and, when the acuteness of the condition has subsided, belladonna and mercury ointments in equal proportions should be applied. Later still, a course of gentle massage with vasogen iodi 6 % is very useful, and a suspensory bandage must be worn until all signs of inflammation have completly subsided.

Many of the larger hydroceles are *associated with varicocele and hernia* and the radical operations for all these conditions must be done at the original operation.

In certain cases, also, the *testicles have become so compressed by the fluid* that their structure is absolutely crushed out of existence, so to speak, and they appear as slightly raised projections on the posterior wall of the tunica vaginalis. Such a testicle should be removed, the cord ligatured high up and a large piece of the scrotum cut away.

This is generally necessary also in cases of *haematocele,* in which condition a free incision must always be made in the tunica vaginalis, the blood and debris thoroughly cleared out, a considerable portion of the thickened sac cut away, and the whole wound left widely open and packed throughout with eusol-soaked gauze ; which is continued until the wound starts to granulate up, when a few sutures may be inserted to bring the sides together and hasten healing. If the testicle is quite atrophied and useless a complete castration should be done, the cord ligatured high up, and the wound partially closed, with a drain for a few days in its lower part.

A similar course must be followed in cases of *suppuration* within the tunica vaginalis from this or any other cause.

Tertiary syphilitic hydroceles, if they do not soon react to constitutional treatment, must be treated in every way exactly like those of simple origin."

OTHER FORMS OF HYDROCELE. The only common varieties of *congenital hydrocele* in our practice are the ordinary complete congenital hydrocele, with congenital hernia or with an opening at the ring so small as to prevent the descent of gut ; and hydrocele of the cord, neither of which present any extraordinary features.

The other form is really originally a congenital hydrocele "due to the persistence of the intra-abdominal portion of the funicular process between the peritoneum and the internal ring, which forms a collection of fluid in a sac communicating by a neck of variable size with the distended tunica vaginalis." (R. and C.) The earlier degrees of this condition we occasionally see as an upward prolongation of the tunica vaginalis, perhaps considerably constricted at the external ring or even below it, the so-called *hydrocele en bissac.* These, in appearance and treatment, correspond entirely with a large elongated ordinary hydrocele of the tunica vaginalis ; but there is another variety, in which a large pouch occupies sometimes the great part of the lower abdomen, and which we are accustomed to call an *abdominal hydrocele.* I can best illustrate this condition by thinking of three recent cases. The patient is usually of middle age and presents himself with one or both sides of the scrotum full of fluid, which is under such tension as to cause the testicle to be pushed down to the extreme bottom of the scrotum and project forwards. On examination it will be found that this collection of fluid is continuous with another much larger collection in the abdomen, extending well out into the iliac region laterally and upwards above the umbilicus and even beyond the middle line of the abdomen. A very distinct fluctuant wave can be elicited from scrotum to abdomen and vice versa. A distinct

constriction can be made out in the inguinal region and, as a rule, the swelling is very tense and the fluid cannot be easily displaced from one portion of the bag to the other. The tumour is dull on percussion throughout and has evidently pushed the intestines away in front of it in its upper part.

The *anatomical relations* of the condition become evident on operation. This consists in a free incision in the neck of the scrotum as for strangulated hernia. The hydrocele sac is then opened and often an enormous quantity of ordinary hydrocele fluid escapes; and in it, as is usually the case in very chronic hydroceles of any kind, cholesterine crystals are abundant, like myriads of golden-yellow grains in the fluid. Sometimes several litres of fluid — in a recent case three litres were measured — fill the enormous sac. The incision is then prolonged up on to the abdomen if necessary and the sac is traced through the external ring. The aponeurosis of the external oblique is divided, as in an operation for hernia, and the conjoined tendon, but particularly the internal oblique muscle, is seen stretched over the mounting sac. This muscle is not divided but is well retracted upwards; and now that the fluid has all been drained off, the rest of the sac, which is here very thin, is seen to be running upwards, entirely extra-peritoneally, between the transversalis fascia, or in the space it should occupy, and the peritoneum. With care and much gentle dissection with a gauze-covered finger the sac can be completely removed, gentle traction being maintained from below during the process. If the condition is recognised and carefully traced up from below, it is never necessary to open the peritoneal cavity, as the abdominal sac is always extra-peritoneal, either entirely behind or forming a large bag occupying the greater part of the pelvis and the hollow of the ilium and loins. After the upper end of the sac has been removed, and it will be noted that this runs under cover of the internal oblique and not through the internal ring, all oozing points, which are not, as a rule, many, must be secured and ligatured.

In most cases, coming out of the site of the internal ring, is a long thin hernial sac, which must be thought of throughout the dissection of the abdominal portion of the sac and carefully searched for. This hernial sac, which is fairly constant in these cases, must be dealt with as in an ordinary operation for hernia; and when it has been ligatured off it will be remarked that there is very little evidence left of any extensive dissection having been recently done in the extra-peritoneal tissues. The intestines have pushed the peritoneum downwards and outwards and the dead space is practically immediately obliterated. All that is necessary to do now is to complete the operation as for hernia, with the object of repairing the much-stretched abdominal wall; and then the scrotal portion of the hydrocele sac is cut away, till only sufficient remains to fold round the cord behind, as in an ordinary operation for hydrocele.

Abdominal hydrocele may occur on both sides but usually one is much larger than the other. The diagnosis may sometimes be very difficult, but the presence of fluctuation of fluid, elicited by pressing with one finger above Poupart's ligament and the other over the scrotum, is very characteristic and once felt cannot be mistaken for anything else. The condition is not at all common, considering the frequency of hydrocele

in general, not more than four cases being admitted annually on an average : and by a peculiar coincidence there always seems to be one case admitted just before the final examinations.

OF INFLAMMATIONS OF THE TESTIS AND EPIDIDYMIS we have only a limited selection. They are not common after gonorrhoea or injury : but there is a form of orchitis, sub-acute in character, which not infrequently attacks the better class of Egyptian patient during the summer. I have never been able to trace this to a urethral inflammation and can only suppose it is due to some slight easily forgotten injury to the organ, or to excessive sexual indulgence. It soon yields to rest and routine treatment but is liable to recur.

TUBERCULOUS DISEASE OF THE TESTIS is fairly frequent among the more educated and Europeanised class of patients. It sometimes starts very insidiously ; but generally, when first seen, has hopelessly involved one side, both epididymis and vas being seriously implicated, and a nodule in the prostate showing the rapid upward extension. On the other side some thickening of epididymis or small irregular nodules along the course of the vas are evident.

In my experience, the best treatment is to remove the worse testicle by a high castration and to hope for the best for the other, at the same time doing everything possible in the way of general and local tuberculous treatment. In some cases the condition clears up ; but only too often it progresses at an alarming rate and a second castration has to be performed. After this operation, the improvement in the patient's general condition is often little short of marvellous, and I have never seen secondary bladder effects afterwards. One not infrequently finds beautiful cystoscopic pictures of miliary tubercles scattered round the base of the bladder on the affected side, though I have never seen marked tuberculous ulceration of the bladder in an Egyptian.

In making a diagnosis of tuberculous testicle, on the strength of irregular nodules along the course of the vas deferens or the cord, the possibility of BILHARZIAL DEPOSITS in these situations must always be recalled ; and here in Egypt, unless the other signs of tuberculous infection are quite evident, we must always presume bilharzia until we prove otherwise. These masses are as a rule larger and more elongated than tuberculous nodules, they are frequently multiple, generally occur on one side only, and the epididymis is quite intact. Nor will there be nodules in the prostate or cystoscopic evidence of tubercles. They tend to increase in size and to soften, but do not as a rule approach the skin and form open fungus ulcers. Their treatment is excision, whenever possible ; or incision with scraping, as for any other bilharzial softening, if they cannot be dissected off from the structures of the cord. They are not usually primarily in the vas but may be very closely adherent to it.

Considering the frequency of syphilis, SYPHILITIC DISEASE OF THE TESTICLE in its various forms is distinctly below the average and presents no essentially Egyptian characteristics ; nor is it necesary to enlarge upon FUNGUS TESTIS.

Of TUMOURS OF THE TESTIS, cystic disease is very occasionally seen ; and endothelioma and sarcoma are among our rarer malignant manifestations.

The incidence of VARICOCELE uncomplicated with other scrotal swelling is low among the Egyptians, which is also the case, as we have seen, with varicose veins elsewhere. A condition of lengthening and dilatation of the veins of the cord, associated with hernia and hydrocele of various kinds, has frequently to be dealt with as part of the operation for the primary condition. Varicocele *per se* has no local peculiarities and the usual operations are performed. In unilateral cases, a considerable length of the plexus of veins is removed between ligatures and the stumps sutured together ; and, if need be, a portion of the skin of the scrotum is completely excised, or the longitudinal incision sutured up transversely. The incision for varicocele generally is made high up and the veins of the cord secured just beyond their exit from the external ring. The testicle is then pulled up and the lower ligature placed on the mass of veins immediately above the testis, care being taken to leave a sufficient number of veins, as well as the artery of the vas, for the future supply of the testicle. In all cases an operation for hydrocele is done at the same time. In cases of double varicocele only the worse side should be done at one time, the second being done subsequently some months later. In the case of an undescended testicle with a varicocele on the other side, it is wiser to be content with excising a portion of the pendulous scrotum, than run the risk of producing atrophy of perhaps the only functioning testis by operation. It must be admitted that atrophy does not often follow the ordinary operation for varicocele if it is carefully done ; but it does occur, as also gangrene of the testis from the inclusion of too many of the dilated veins in the ligature and the consequent death of the organ from a deficiency or absence of blood supply.

The *after-treatment* of the operation for varicocele is practically the same as that of hydrocele, with elevation of the scrotum on a scrotal shelf, the application of an ice-bag, and the subsequent wearing of a suspensory bandage for some months afterwards. Should orchitis occur it must be treated on the lines previously detailed.

We have had a few cases of THROMBOSIS in thickened varicose veins of the cord which led to a diagnosis of tubercle or bilharzia, but the condition is not common.

Mention has already been made with Filariasis of the occurrence of chains of DILATED LYMPHATICS in the substance of the spermatic cord, and this condition must be treated on its discovery in all respects like a varicocele, with removal of the greater portion of the dilated lymphatics between ligatures. Here again some lymphatics must be left to allow the return circulation of lymph from the testis. It is a question how far these dilated lymphatics act as part of a collateral lymph circulation, and, on this account, their removal must not be too radical, or secondary elephantiatic manifestations may appear in the neighbourhood subsequently.

Finally, the distinctive signs of cellulitis of the spermatic cord, or FUNICULITIS, must always be kept in mind when examining any scrotal case in Egypt ; and, to return for a moment to the exterior of the scrotum and end our treatise with a reference to another essentially Eastern, if not entirely Egyptian, condition, we would again direct attention to that peculiar localised GANGRENE OF THE SCROTUM, which has been described in its appropriate section.

A COURSE OF OPERATIONS ON THE DEAD BODY.

PART I.

THE LIGATURE OF ARTERIES.

The instruments required for the ligature of an artery in its continuity are a scalpel, dissecting forceps, blunt hooks, retractors, an aneurism needle and sutures.

A free incision is made through the skin in the line of the artery, the left hand being used to steady the skin as it is incised. The length of the incision varies with the artery but it should never be less than two inches (five centimetres). The scalpel must be held like a dinner knife, the handle in the palm of the hand and the index finger along the back of the blade close to the handle. The point enters the skin at right angles to the line of the limb, the actual cutting done with a steady sawing movement, and the knife withdrawn at the end of the incision in the same position as it entered. The whole thickness of the skin must be divided in the whole length of the incision so as not to leave any shelving ends. In most cases it is more convenient to make the incision from above downwards on the right side of the body and from below upwards on the left.

The superficial and deep fascia must next be divided, the incision being of the same length as that through the skin to prevent the formation of a funnel-shaped wound. The muscles are now exposed and must be separated along the lines of the inter-muscular connective tissue planes with the handle of the scalpel. In many instances the gap between muscles or tendons is more easily felt than seen. All feeling for edges of muscles or for any other structure in the depths of the incision is to be done with the left index finger. The incision is further deepened as necessary, until the artery and the structures in relation with it, or some conspicuous landmark, are felt. An artery will feel like a piece of elastic tubing, and when flattened out has rather hard edges and a shallow central depression along its course. Veins are quite soft and thin-walled and flatten out completely on pressure. Nerves are hard and rounded, roll under the finger, and cannot be flattened out.

Having exposed the artery, a small piece of its sheath is picked up with the dissecting forceps across the line of the artery. A cut is then made into this sheath with the scalpel placed on the flat, its back being directed towards the artery and its edge towards the forceps, and a small slit is made by cutting with the middle of the blade towards the end of the forceps. Still retaining hold of the sheath with the forceps, the point of the aneurism needle is inserted into the slit, the point being passed away from the forceps with the concavity of the needle towards the artery. The end of the needle is gently worked to and fro between the sheath and the artery, until it has completely encircled the vessel. The point then emerges beside the end of the forceps and any pieces of connective tissue or sheath carried before it are divided with a touch of the scalpel. The slit in the sheath must be quite small and the needle must

not be roughly used or it will separate too much of the sheath from the artery. The artery must now be gently pressed between the finger and the concavity of the needle to make sure that no other structures are included. The needle is then threaded and withdrawn, pulling one end of the ligature with it. A firm reef knot is tied, the two index fingers being placed deep in the incision as the ligature is drawn tight to prevent the artery from being displaced from its bed.

No definite sheath is found in the arteries below the knee or elbow ; and when there is no sheath the artery is to be separated from its relations and carefully encircled by the aneurism needle and ligatured, after making sure that it really is the artery, and that no other structures are included in the bite of the ligature.

LIGATURE OF THE ARTERIES OF THE UPPER EXTREMITY.

THE RADIAL ARTERY.

Line of the artery. With the forearm in extreme supination and the elbow extended, the line of the radial artery is from the middle of the bend of the elbow to a point immediately to the ulnar side of the styloid process of the radius.

Ligature of the artery in the lower third of the forearm. Having placed the limb in the proper position, a free incision is made through the skin in the line of the artery, midway between the tendons of the supinator longus and the flexor carpi radialis. The incision should be 2 ins. long (5 c.m.) and end about ½ in. (1.25 c.m.) above the wrist joint. Some superficial branches of the radial vein and some terminal filaments of the musculo-cutaneous nerve will be cut, and the deep fascia is then divided in the whole length of the superficial incision. The artery should be at once exposed, lying on the pronator quadratus and surrounded by many small venae comites.

In this situation the supinator longus is entirely tendinous ; and the artery lies very superficially, between this tendon and that of the flexor carpi radialis, and is easily defined.

Ligature of the artery in the middle of the forearm. With the limb in the same position as for the preceding operation, an incision 3 ins. long (7.5.c.m.) is made 1/4 in. (0.625 c.m.) to the outer side of the line of the artery, the centre of the incision corresponding to the middle of the forearm. The same superficial veins and nerves as before are met with, the deep fascia divided, and the ulnar border of the supinator longus clearly defined. In this situation it is just becoming tendinous, but in the upper third of the forearm it is still entirely muscular and completely conceals the artery. The artery will be found lying on the pronator radii teres ; but rather below the middle of the forearm it rests upon the flexor sublimis digitorum and flexor longus pollicis. The radial nerve is to the radial side of the artery, working towards the back of the forearm under cover of the supinator longus.

It must be remembered that the artery above the lower third of the forearm is no longer superficial, but is overlapped by the supinator longus, and search must be made for it beneath the clearly defined *ulnar* border of the supinator longus and not on its radial side. A large superficial vein may sometimes be tied in mistake for the artery.

THE ULNAR ARTERY.

Line of the artery. With the forearm in extreme supination and the elbow extended, a line drawn from the tip of the internal condyle of the humerus to the radial side of the pisiform bone will indicate the position of the artery in the lower two-thirds of its course. The upper third lies deeply under the muscles arising from the internal condyle, on a line running obliquely inwards from the middle of the front of the elbow-joint to meet the above-mentioned line at the junction of the upper and middle thirds of the forearm.

Ligature of the artery in the lower third of the forearm. The limb is placed in the proper position and an incision 2 ins. long (5 c.m.) is made in the line of the artery, close to the radial side of the flexor carpi ulnaris, and extending down to a point 1/2 in. (1.25 c.m.) above the wrist joint. Branches of the ulnar vein and the internal cutaneous nerve are cut and the deep fascia divided. The radial border of the flexor carpi ulnaris, which is here entirely tendinous, is exposed, and the ulnar nerve is usually clearly seen ; but the artery may be almost covered by the nerve or bound down by a thick band of fascia to the pronator quadratus. By drawing the flexor carpi ulnaris tendon towards the ulnar side the artery will be found, on the radial side of the nerve. The aneurism needle is passed round it from within outwards, away from the nerve.

The ulnar nerve meets the artery in the middle of the forearm and runs down between it and the flexor carpi ulnaris. The artery is quite superficial below and passes on over the front of the wrist to form the superficial palmar arch. Sometimes difficulty may arise in the ligature of this artery from exposing the ulnar side of the flexor carpi ulnaris. Into this *wrong* border muscular fibres are entering almost as far down as the wrist ; and the mistake will be thus easily recognised, as the radial border is quite bare of muscular fibres in this situation.

Ligature of the artery above the middle of the forearm. With the limb in the same position as before, a 4in. (10 c.m.) incision must be made,running obliquely downwards and inwards, exactly in the line of the artery, in the upper third of the forearm and thence straight down the arm. Branches of the superficial veins and nerves are divided as in the last operation, and the deep fascia incised in the line of separation between the flexor sublimis digitorum and the flexor carpi ulnaris. The space between these two muscles is freely opened up,the forearm being well flexed to facilitate the dissection. This line of separation is quite obliquely placed and must be defined before any further search is made for the artery. Sometimes a small artery may be seen issuing from between the muscles and may prove a valuable guide. In the depths of the space, lying on the flexor profundus digitorum, the ulnar nerve will be first seen, coming straight down the arm from behind the condyle and meeting the artery, which is running across obliquely from the front of the elbow-joint. The actual point of meeting is the middle of the forearm. The needle must be passed away from the nerve to avoid its incl usion in the ligature.

Once the proper space is opened up the artery must be sought towards the radial side. It is quite easy to get too much to the ulnar side, between the flexor carpi ulnaris and the extensor muscles of the forearm, if the incision is not made exactly in the proper line.

THE BRACHIAL ARTERY.

Line of the artery. The artery extends from the outlet of the axilla, along the inner border of the biceps, to just below the elbow-joint, where it divides into the radial and ulnar arteries. With the arm placed at right angles to the side of the chest and the forearm supinated, the line of the artery is from the junction of the upper and middle thirds of the axilla (the vertical line from the anterior to the posterior folds of the axilla being divided into thirds), along the inner side of the arm, to the middle of the front of the elbow-joint.

Ligature of the artery at the bend of the elbow. The biceps tendon is first defined by flexing and extending the elbow, and an oblique incision 3 ins.long (7.5 c.m.) is made through the skin, to the inner side of the tendon, running downwards and outwards. The middle of the incision lies exactly over the middle of the fold of the joint. Branches of the internal cutaneous nerve, and the median basilic vein and its tributaries, are cut as they lie on the thick bicipital fascia, which is running inwards to the internal condyle. This fascia is divided in its turn in the original line and the median nerve is at once exposed, running across the middle of the ante-cubital fossa and almost completely overlapping the brachial artery, which is surrounded by a mesh-work of venae comites. The median nerve must be carefully avoided in passing the ligature.

The space in which the artery lies is bounded by the supinator longus externally and by the pronator radii teres internally, and bisected by the median nerve, which is overlying the artery. In the depths of the space, in the middle is the insertion of the brachialis anticus,and, towards the outer side, the tendon of the biceps, running across to its insertion into the tuberosity of the radius.

The skin incision must be made quite obliquely and the bicipital fascia well divided before searching for the artery.

Ligature of the artery in the middle of the arm. The arm must be drawn well away from the side, the elbow slightly flexed, and the arm supported, to prevent the limb resting on the table, as if this is done the triceps is pushed up and may hide the artery. The operator sits down between the arm and the chest and makes an incision at least 3 ins. (7.5 c.m.) long, along the inner border of the biceps, in the line of the vessel. The median nerve is usually the first structure seen, on dividing the deep fascia, and branches of the two internal cutaneous nerves and the median basilic vein. The belly of the biceps is now drawn to the outer side and the artery, surrounded by venae comites and lying in the midst of a group of nerves, is isolated and ligatured, the needle being carefully passed to avoid the inclusion of any of the nerves.

The artery lies, in the upper part of its course, to the inner side of the coraco-brachialis,and, below the middle of the arm, to the inner side of the biceps. Behind, from above downwards, it rests upon the middle and inner heads of the triceps, the coraco-brachialis and the brachialis anticus; while the musculo-spiral nerve and the superior profunda artery wind round behind it, towards the outer side, in the middle of the arm. The median nerve lies over it and the ulnar nerve to its inner side, the latter structure separating it from the internal cutaneous nerve; while the musculo-cutaneous nerve is to its outer side.

The difficulty in ligaturing the brachial artery in the middle of the arm is generally due to faulty position of the arm, and want of accuracy in making the incision in the proper line. The artery is often completely surrounded by the nerves and it is difficult to dissociate it from them, especially when the artery is small. Strict observance of the landmarks in the different stages of the operation, and careful dissection of the artery from the midst of its sheathing of nerves, are very necessary for a successful operation.

It is quite easy to miss the brachial and to define and ligature the superior profunda artery, which accompanies the ulnar nerve, if the operation is carelessly performed.

THE AXILLARY ARTERY.

Line of the artery. With the arm abducted almost at right angles from the body, a line from the centre of the clavicle to the junction of the upper and middle thirds of the outlet of the axilla will indicate the position of the artery.

The artery extends from the outer margin of the first rib to the lower border of the axilla, and may be ligatured in its first or its third part.

Ligature of the artery in its third part in the axilla. With the arm at right angles to the body and rotated slightly outwards, the operator, sitting between the arm and the chest, makes a 4 in. (10 c.m.) incision, parallel to the anterior fold of the axilla, at the junction of the upper and middle thirds of a vertical line joining the anterior and posterior folds of the axilla. The incision should extend from the side of the chest, well up into the vault of the axilla, and end just inside the outlet of the axilla. The inner border of the coraco-brachialis is exposed when the deep fascia is divided, together with the musculo-cutaneous nerve and the outer head of the median nerve. The artery should now be seen, but enveloped in nerves and many venae comites, which are here joining with the basilic vein to form the axillary vein on the inner side of the artery. The sheath of the artery is opened and the needle passed away from the vein, and avoiding inclusion of the median nerve in the ligature. The inner head of the median, the ulnar, and the internal cutaneous nerves,lie on the inner side of the artery,in close contact with it, and must be carefully avoided also. Behind, the artery rests upon the subscapularis latissimus dorsi, and the teres major; and the circumflex nerve above, and the beginning of the musculo-spiral nerve below, cross behind it.

The exposure of the bundle of nerves accompanying the artery is quite easy, though some difficulty may be experienced in isolating the artery.

Ligature of the first part of the artery. The body must lie flat on the back, with the point of the shoulder pulled well down and the arm lying close to the side of the chest. A small block may be placed between the scapulae behind to keep the shoulders back. A long incision somewhat convex downwards is made through the skin just below the clavicle, from the tip of the coracoid process to the sterno-clavicular joint. The centre of the concavity lies about 1/2 in. (1.25 c.m.) below the middle of the clavicle. The superficial fascia platysma and supraclavicular nerves are now divided and the pectoralis major muscle and its fascia exposed. This fascia and muscle is then divided in the whole length of the incision, thus dividing the part of its clavicular origin, and, in the outer end of the wound, the cephalic vein is seen and carefully avoided. The costo-coracoid membrane now comes into view, filling in the space between the clavicle and the upper border of the pectoralis minor and pierced by the cephalic vein and the acromio-thoracic vessels. This membrane is divided from within outwards and the cephalic vein traced in its course over the axillary artery to its termination in the axillary vein. By careful dissection in the outer angle of the wound, to the inner side of the coracoid process, we first find the outer cord of the brachial plexus and, just to its inner side, the artery, which is running very obliquely outwards from the centre of the clavicle, with the vein on its inner side and the cords of the brachial plexus well to its outer side. In this proceeding the cephalic vein should be drawn inwards by a blunt hook. The needle is passed from within outwards away from the vein, and the nerve cords must not be included in the ligature.

It is quite easy to mistake one of the cords of the brachial plexus for the artery, and just as easy to wound the axillary vein during the operation. The artery is deeply placed and retractors must be freely used throughout to obtain a good view of the deeper parts, after the pectoralis major has been divided.

LIGATURE OF THE ARTERIES OF THE HEAD AND NECK.

THE SUBCLAVIAN ARTERY.

Ligature of this artery is only practised in its *third part*, which lies deep down in the posterior triangle of the neck. A block is placed under the shoulders, the arm is pulled well down by the side of the chest so as to depress the point of the shoulder, and the head is turned well towards the opposite side. The skin over the posterior triangle is stretched and drawn downwards, and an incision, at least 3 ins (7.5 c.m.) in length,made on the clavicle, extending from the posterior border of the sterno-mastoid to the anterior border of the trapezius. The skin superficial fascia supra-clavicular nerves and some superficial veins and the platysma are divided, and when the skin is no longer stretched the incision lies about 1/2 inch (1.25 c.m.) above the clavicle. The deep cervical fascia is thus exposed in the whole length of the incision. The external jugular vein is seen

running obliquely downwards to the middle of the clavicle from the angle of the jaw. This is either drawn outwards, or divided between ligatures, and the outer border of the scalenus anticus exposed, almost hidden behind the posterior border of the sterno-mastoid.

When the space to the outer side of the anterior scalenus has been well opened up with retractors, the omo-hyoid muscle will be seen running obliquely upwards and inwards, and just below it a venous plexus, formed by the supra-scapular, transverse cervical, and external jugular veins, which may greatly obscure the view. Pushing the index finger down along the outer edge of the scalenus anticus and directing its point downwards and somewhat backwards and inwards, the scalene tubercle on the first rib is felt, with the artery in the groove on this rib to the outer side of the tubercle. The subclavian vein lies in the groove to its inner side, but is on a more superficial plane than the artery, and both are running out very obliquely to cross behind the middle of the clavicle on their way to the axilla.

After dividing this plexus of veins and dissecting deeply in the omo-hyoid triangle, the cords of the brachial plexus are seen ; and below and to the inner side of them the artery is exposed and its sheath opened. The needle is passed from above downwards and from behind forwards to avoid the vein and the lowest cord of the plexus, which latter is in close contact with the artery.

Before the ligature is finally tied it is necessary to make quite sure that it really encircles the artery and nothing but the artery.

If there is not sufficient room to expose the artery, the trapezius and the sterno-mastoid may be incised to some extent ; but if the position is properly maintained, and the landmarks thoroughly exposed and recognised before the subsequent stages of the operation are begun, the difficulties are greatly minimised. Make sure of the external border of the scalenus and work from that outwards into the posterior triangle, and not too much inwards towards the middle line of the neck ; and do not forget the very oblique course the artery takes to gain the middle of the clavicle. The artery will be in a triangle, between the external border of the scalenus anticus, the clavicle, and the cords of the brachial plexus.

LIGATURE OF THE COMMON CAROTID ARTERY.

Line of the Artery. With the patient lying on the back, the shoulders square, the point of the chin raised and the head drawn towards the opposite side, so as to put the neck on the stretch, a line drawn from the sterno-clavicular joint to a point midway between the angle of the jaw and the tip of the mastoid process, will indicate the position of the artery and its continuation upwards, the external carotid. This line runs along the anterior border of the sterno-mastoid muscle.

Ligature of the artery at the level of the cricoid cartilage. The body is placed in the position indicated above, and a skin incision 3 in. (7.5. c.m.) long is made in the line of the vessel, its centre corresponding to the cricoid cartilage, The skin and platysma are divided, with some branches of the superficial cervical nerves and the anterior jugular vein.

When the deep fascia is incised, the anterior border of the sterno-mastoid is clearly defined and traced downwards to the omo-hyoid, which is running to the middle line and meets the sterno-mastoid obliquely just below the cricoid cartilage. The artery is found in the interval between the two muscles, and rests upon the anterior prominence of the transverse process of the sixth cervical vertebra, which thus serves as a guide to the vessel. The sheath of the artery is opened on its inner side, the small sterno-mastoid branch of the artery, the middle thyroid veins, and the descendens noni being avoided. Within the sheath lies the internal jugular vein on outer side, and the vagus nerve behind the artery; while behind the sheath, lying upon the cervical spine, is the cervical sympathetic cord. The needle must be carefully passed from without inwards so as to avoid inclusion of the vein or the nerve.

If the neck is not placed in the proper position and the anterior border of the sterno-mastoid not properly defined, there may be difficulty, as the artery is very movable and may easily be overlapped by the muscle. Sometimes even the posterior border of the muscle is exposed.

LIGATURE OF THE EXTERNAL CAROTID ARTERY.

The position of the patient and the line of the artery are the same as for the common carotid. The incision extends from the angle of the jaw to the upper border of the thyroid cartilage, and lies along the anterior border of the sterno-mastoid. This landmark is clearly defined, after the skin superficial fascia platysma and superficial veins have been divided. In the upper end of the incision, after retracting the sterno-mastoid outwards, is seen the posterior belly of the digastric, with the hypoglossal nerve winding round it from below and the facial and lingual veins overlying it. The artery will be felt at the tip of the great cornu of the hyoid bone, and the sheath is opened on the inner side. The needle is passed from the outer side to avoid the internal jugular vein and the internal carotid artery. The ligature is generally placed on the artery between the superior thyroid and lingual branches. Behind the sheath is the superior laryngeal nerve, and internal to it the descendens noni.

This operation is difficult; on account of the large number of branches of the main artery, and their accompanying veins, and the important nerves in this situation.

LIGATURE OF THE INTERNAL CAROTID ARTERY.

This operation is almost exactly similar to that just described. The external carotid is first exposed and drawn to the inner side, the digastric muscle drawn upwards, and the sheath of the internal carotid opened directly in front, just above the great cornu of the hyoid bone, as it is exposed deep in the space. The needle is passed from without inwards, to avoid the internal jugular vein and the vagus, with the same precautions as for the external carotid.

LIGATURE OF THE LINGUAL ARTERY.

The artery is ligatured as it lies underneath the hyoglossus muscle in the digastric triangle. The patient lies on the back with the arm by the side, the point of the shoulder depressed, and the head turned to the opposite side. The lower jaw is fixed and the chin pulled upwards. An incision, like the head of a broad arrow, is made, starting just below and to the outer side of the symphysis of the lower jaw and running down to the tip of the great cornu of the hyoid bone, then upwards and outwards to end just below and to the inner side of the angle of the jaw. This will then be a triangular incision, the base at the margin of the jaw and the broad apex at the great cornu of the hyoid bone.

The skin superficial fascia and platysma are divided, and the superficial veins and the communicating branches between the anterior jugular, the facial, and communicating branch of the temporo-maxillary veins, are clearly seen. The skin flap is now freely dissected up and turned right on to the face, thus exposing the greater part of the submaxillary gland. The facial artery and vein must be carefully avoided or secured between ligatures. The fascial connections of the submaxillary gland are now divided all round and the whole gland turned up on to the face. The digastric triangle is thus thoroughly exposed. The hyoglossus muscle is seen in the anterior part of the triangle, just outside the anterior belly of the digastric, and running across it is the hypoglossal nerve and the lingual vein. The tendon of the digastric is pulled well down with a blunt hook and an incision is made through the hyoglossus muscle, immediately below and parallel to the hypoglossal nerve. On completely dividing its fibres, the lingual artery is seen running upwards and inwards to the tongue, accompanied by the ranine vein. Both these structures lie upon the genio-hyoglossus muscle.

The secrets of success in this operation are to thoroughly define and turn up the submaxillary gland, and not to go on until the hypoglossal nerve is clearly seen. The final incision must then be made through the hyoglossus muscle between this nerve and the great cornu of the hyoid bone, to which the apex of the digastric muscle is attached. The artery is to be found in the anterior half of the digastric triangle, not in the posterior.

LIGATURE OF THE FACIAL ARTERY.

This artery may be ligatured through a short incision on the lower margin of the lower jaw and parallel to it; just in front of the anterior border of the masseter. The facial vein lies to the outer side and must not be included in the ligature.

LIGATURE OF THE TEMPORAL ARTERY.

A vertical incision between the tragus of the ear and the condyle of the lower jaw will expose this artery, after dividing a thick fascia overlying the vessel.

LIGATURE OF THE OCCIPITAL ARTERY.

An incision running from the tip of the mastoid process and skirting its posterior border will expose the various muscles around this process. These are divided and the posterior fibres of the sterno-mastoid and the splenius muscles also. The artery is then felt in the space between the mastoid process and the transverse process of the atlas, coming backwards and upwards from under the posterior belly of the digastric. The space is cleared and the ligature passed in the most convenient direction.

THE OPERATION FOR HAEMORRHAGE FROM RUPTURE OF THE MIDDLE MENINGEAL ARTERY.

The body lies on the back, with the head turned well towards the opposite side and supported on a block or sandbag. A line is then drawn obliquely backwards and upwards from the external angular process for a distance of 1¼ in. (3 c.m.). Another line is then drawn from the middle of the zygoma directly upwards for a similar distance. The point at which these two lines intersect indicates the site of the anterior branch of the middle meningeal artery within the skull. A stout sharp needle is now pushed through the soft tissues at this point of intersection so as to make a mark on the underlying bone for future guidance. A large tongue-shaped incision is then made and includes all the tissues right down to the bone, periosteum and all,and a flap is turned down on to the side of the face,the periosteum being separated from the bone with a periosteal elevator. The base of the flap extends along the whole length of the upper margin of the zygoma ; and the incision curves upwards into the temporal fossa, skirting the outer margin of the orbit and the external angular process anteriorly, and running down in front of the ear behind to meet the posterior end of the zygoma. The pin of the trephine is now placed on the mark previously made on the bone and the circle of bone removed, great care being taken not to go too deeply and so injure the dura mater. When the piece of bone is removed, the anterior branch of the middle meningeal artery is at once seen on the exposed outer surface of the dura mater, and the groove in which it was lying is very evident on the removed piece of bone. The blood clot being removed, the divided artery must be secured or blocked as necessary.

The posterior branch of the artery may be exposed by making a trephine opening, on a line drawn straight backward from the external angular process and parallel to the zygoma, at a point where a vertical line carried upwards from the anterior border of the mastoid process meets it.

LIGATURE OF THE ARTERIES OF THE LOWER EXTREMITY.

THE ANTERIOR TIBIAL ARTERY.

Line of the artery. With the body lying on the back, the leg straight down, the foot extended, and the limb strongly rotated inwards from the knee downwards, the line of the artery is from a point midway between the head of the fibula and the outer tuberosity of the tibia, down the leg, to the middle of the front of the ankle-joint.

Ligature of the artery in the middle of the leg. A 4 in. (10 c.m.) incision is made in the line of the artery, with the limb in the proper position, in the middle of the leg, and the skin and superficial fascia and branches of the musculo-cutaneous and internal saphenous nerves are divided. Before the deep fascia is divided, the separation between the tibialis anticus and the extensor longus digitorum must be looked for. The space between these two muscles is sometimes marked by a small branch of the artery, or exists as a definite interval filled in with a little fat. The deep fascia is now freely divided and the line of separation quite clearly established. The space is opened up with the handle of the knife, and the muscles relaxed by bending the knee and dorsi-flexing the foot. In the depths of the space the artery is seen lying upon the inter-osseous membrane with its venae comites. The anterior tibial nerve lies to its outer side, and the needle is passed from the nerve to avoid its inclusion in the ligature.

Just below the middle of the leg the extensor proprius hallucis runs over the artery obliquely from without inwards ; and, in the lower third, the vessel is to be sought for between the tendons of the tibialis anticus and the extensor proprius hallucis.

It is probably easier to ligature this vessel by making the incision in the line of the artery, with the leg strongly flexed at the knee and the sole of the foot resting on the table ; but however it is done, the essential point of the operation consists in opening up the proper space, which can only be ensured if the incision is accurately placed over the line of the artery. Flexion of the knee and the foot, and strong retraction of the separated muscles, all help in the subsequent search for the artery—which is very deeply placed—and its successful ligature. The space to the outer side of the extensor longus digitorum, between it and the peronei muscles, may even be opened up by careless dissection.

THE POSTERIOR TIBIAL ARTERY.

Line of the artery. With the body lying on the back, the knee flexed, and the whole leg below the knee rotated strongly outwards, the line of the artery is from the centre of the popliteal space, down the leg, to a point midway between the tip of the inner malleolus and the heel.

Ligature of the artery behind the internal malleolus. With the leg in the proper position, an incision is made 1/2 in. (1.25 c.m.) behind the lower third of the inner border of the tibia. It runs at first straight downwards and then curves round the margin of the internal malleolus from behind forwards, keeping the same distance from the bone. It begins at a level 1 in. (2.5 c.m.) above the tip of the malleolus behind, and ends 1 in. (2.5. c.m.) in front of it on the inner border of the foot. The incision is deepened in its whole extent and the internal annular ligament divided, with some branches of the internal saphenous vein and nerve. The artery is found lying between or even overlapped by its two veins. The posterior tibial nerve lies to the outer side and the needle is passed away from it round the artery. The well-worn mnemonic may be quoted here to refresh the memory and indicate the relation of the structures

behind the internal malleous. It is "Timothy does vex all very nervous people", the first letters of each word indicating respectively:—The *Tibialis* posticus, the flexor longus *Digitorum*, the *Vein*, the posterior tibial *Artery*, the second *Vein*, the posterior tibial *Nerve*, and, finally, the flexor longus *Pollicis* or hallucis.

Ligature of the artery in the middle of the leg. Having placed the leg in the position for indicating the line of the artery, the operator stands on the outer side of the limb and makes a free incision in the middle of the leg, parallel to the inner border of the tibia and 3/4 in. (2 c.m.) behind it. The internal saphenous vein must be avoided or secured, and the deep fascia is divided in the same line and to the same extent. This exposes the inner margin of the gastrocnemius, showing its large flat aponeurotic face on its under surface. This muscle is retracted backwards, any fibres of it attached to the inner border of the tibia being divided. The soleus is now exposed and must be cut in the whole length of the incision in a special way. The knife is placed exactly at right angles to the long axis of the tibia, and the point entered in this position at the upper end of the incision, well into the main belly of the muscle. The blade is pushed in till the point strikes the bone of the posterior surface of the tibia. (On the left side the knife is entered at the lower end of the incision and the muscle divided from below upwards). The muscle is now cut from above downwards in the whole length of the incision, the knife being kept in this horizontal position throughout and dividing the muscle perpendicular to the direction of its fibres. The cut edges of the soleus being well retracted, the artery is to be sought towards the outer border of the tibia, and is covered by a thick fascia binding down the tibialis posticus and the flexor longus digitorum. This fascia having been divided, the artery surrounded by its venae comites is seen, with the posterior tibial nerve on its outer side. The needle is passed away from the nerve round the artery.

This is a difficult artery to ligature for many reasons. The inner edge of the gastrocnemius may be mistaken for the soleus and be divided without finding the artery. The artery is very deeply placed and the muscles must be well relaxed and retracted while searching for it. Moreover, the vessel lies towards the outer border of the tibia and not to its inner side ; and it must be remembered that the artery lies on the flexor longus digitorum beside the tibialis posticus, and is seen immediately the fascia over these muscles is divided, and not deeper down on the interosseous membrane. As in most of these operations, the greatest attention must be paid to the proper carrying out of every stage of the operation, and one must not attempt to go on to a further stage until the preceding steps have all been thoroughly finished.

THE POPLITEAL ARTERY.

The popliteal artery is the continuation of the femoral artery, and extends from the opening in the adductor magnus, at the junction of the middle and lower third of the thigh, to the lower border of the popliteus muscle. It winds round the lower third of the femur till it reaches the middle line of the large bare space of the posterior surface ; and then runs straight down over the posterior ligament of the knee-joint and the popliteus muscle.

Ligature of the artery in the popliteal space. The body is rolled over on to the face and the leg is held fully extended. An incision is made in the middle of the popliteal space, from a point about 1 in. (2.5.cm.) above the line of the knee-joint, well down the leg. The skin and superficial fascia are divided, the external saphenous nerve and vein are drawn to one side, the deep fascia incised, and the artery sought for deep in the fat, in the interval between the two heads of the gastrocnemius. The main nerve supplying the soleus will be exposed,and above it the internal popliteal nerve and popliteal vein, with the artery on the outer side and anterior to them. The needle is passed from the inner side and the vein avoided.

The knee should be flexed to relax the muscles and so facilitate the finding of the artery.

Ligature of the popliteal artery in the thigh. The body lies on the back, with the knee flexed and the whole limb lying on its outer side. The incision begins at the junction of the middle and lower third of the thigh, and is parallel to and just behind the tendon of the adductor magnus, which must first be traced to its insertion into the adductor tubercle, the limit of the incision below.

The internal saphenous vein is avoided, the upper edge of the sartorius defined and the muscle drawn backwards. The adductor magnus muscle is drawn forwards and, in the space thus made, the semi-membranosus is found and drawn downwards and backwards, exposing the artery as it lies close to the bone, deep down between the adductor magnus and the semi-membranosus. It lies very nearly in the middle line behind, running down the middle of the bare surface of bone on this aspect of the femur. The vein is on the outer side and is not easily avoided as the needle is passed round the artery.

THE FEMORAL ARTERY.

Line of the artery. This artery is the continuation of the external iliac, and extends from Poupart's ligament to the opening in the adductor magnus, at the junction of the middle and lower third of the thigh. The first 2 ins (5 c.m.) of the artery below Poupart's ligament is known as the common femoral. This then divides into the superficial femoral, which takes a superficial course down the thigh,and the profunda femoris,which supplies all the deeper structures covering the femur.

With the body on the back, the hip slightly flexed, the thigh abducted and rotated outwards, the line of the common femoral and its direct continuation downwards, the superficial femoral, is from a point midway between the anterior superior iliac spine and the symphysis pubis to the adductor tubercle on the inner condyle of the femur.

Ligature of the artery in Hunter's Canal. With the leg in the proper position, an incision 3 in. long (7.5.cm.) is made in the line of the artery, in the middle third of the thigh. The skin, and the superficial and deep fasciae are divided and the internal saphenous vein avoided. The sartorius muscle,distinguished by its fibres running obliquely downwards and inwards, is defined and drawn backwards. The roof of Hunter's canal,

which consists of a thick fibrous band, connecting the adductor longus and adductor magnus internally and the vastus internus externally, is thus exposed. Lying upon it is the nerve to the vastus internus. This roof is then incised in the original line and the canal thus opened up, exposing the artery, with the internal saphenous nerve lying upon it and the femoral vein almost hidden behind it. The needle is passed with care to avoid the vein.

This operation if carefully performed is quite easy ; but the line must first be accurately defined, the incision made exactly upon it, the sartorius identified by the direction of its fibres, and the canal opened in the proper place, or difficulties will arise. Sometimes the dissection is carried on to the inner border of the sartorius ; and again the muscle is at times so flattened and superficial that it may not be recognised if the incision happens to run along its inner border. Most of the trouble, however, comes from making the original incision too far to the inner side of the thigh and internal to the proper line, and this generally arises from faulty position of the limb.

Ligature of the artery at the apex of Scarpa's triangle. The position of the limb being as before, the incision is made in the line of the artery, beginning about 2 1/2 ins (6.5 c.m.) below Poupart's ligament and running beyond the apex of the triangle. The apex is about 4 1/2 in. (11.5 c.m.) below Poupart's ligament. The superficial structures are divided, and, after incising the deep fascia, the sartorius is defined. The artery is sought for immediately to the inner side of this muscle, just where it forms the apex of Scarpa's triangle, the muscle being drawn outwards as necessary. The artery has the femoral vein on its inner side and is ligatured at this point, the needle being passed from the vein. The direction of the fibres of the sartorius, obliquely downwards and inwards, is an important guide, and the muscle should be traced to the point where it meets the adductors, the fibres of which in contrast run straight down the thigh.

THE EXTERNAL ILIAC ARTERY.

Line of the artery. With the body lying on the back, the line of the artery is from a point 1 in. (2.5.c.m.) below and to the left of the umbilicus to a point midway between the anterior superior iliac spine and the symphysis pubis. The upper third of this line indicates the position of the common iliac, the rest the external iliac artery.

Ligature of the artery by the extra-peritoneal route. On the left side an incision is made parallel to Poupart's ligament and about 1 in. (2.5.cm.) above it, commencing just outside the middle point of the ligament and running upwards and outwards nearly to the anterior superior iliac spine, and then curved upwards for 2 ins. (5 c.m.) On the right side the incision may be begun at its upper end more easily. The skin is divided and the aponeurosis of the external oblique muscle exposed, lying on which are the branches of the superficial circumflex iliac artery. This aponeurosis is next divided in the line of the skin incision, and then the internal oblique and the transversalis muscles in their turn. The trans-

versalis fascia is thus exposed and must be carefully divided in the same line. The extra-peritoneal fat is now exposed, and the peritoneum is separated from the iliac fossa and pushed upwards and inwards in the direction of the umbilicus with the fingers, the greatest care being taken not to make a hole in the membrane while so doing. When the muscles and peritoneum are properly retracted, the psoas muscle will be found, with the genito-crural nerve running downwards on it; and on the inner border of the muscle the external iliac artery will be seen, covered by a layer of fascia. This having been divided the artery is carefully separated from its vein, which lies on its inner side, and ligatured, the needle being passed from the vein. The large anterior crural nerve will be seen on the outer border of the psoas muscle at some distance from the artery.

If the parts are well retracted as they are cut and the peritoneum is carefully pushed up out of the way, the operation is not difficult.

THE COMMON ILIAC ARTERY.

This artery may be ligatured by making a long curved incision, commencing just inside the middle of Poupart's ligament and 1 1/2 in. (4c.m.) above it, then running outwards towards the crest of the ilium, and finally upwards towards the ribs. The stages of the operation are precisely similar to that for ligature of the external iliac artery, but the artery is found at a higher level by tracing up the external iliac to its junction with the internal iliac and beyond it. The common iliac artery is then ligatured, the needle passing from within outwards to avoid the vein and also the ureter.

THE INTERNAL ILIAC ARTERY.

The artery may be ligatured through the same incision as that employed for the common iliac; but all three iliac arteries may be more satisfactorily exposed and ligatured through a trans-peritoneal operation in actual surgical practice.

PART II.

AMPUTATIONS AND EXCISIONS.

In amputations on the living subject, it must always be remembered that when soft parts are cut across the skin retracts to some extent, and the muscles very considerably ; and, moreover, that the muscles not attached to the bone which is divided retract much more than those which are. In a circular amputation of the arm, for instance, the divided biceps will retract very much more than the triceps. Allowance must be made for this muscular retraction and the free muscles cut longer than those attached to the bone, or a conical stump will result, in which case there is a risk of the end of the bone subsequently finding its way through the scar.

When flaps consist largely of skin and subcutaneous tissues, the flaps must be cut about half a size larger than actually necessary to cover the whole area of the section of the limb at the site of the amputation. It is becoming, however, more and more customary to cut the muscles long and so provide a good muscular covering for the end of the stump.

Naturally the tissues do not retract after division in the dead body ; but in all cases the flaps must be cut exactly as they would be if the operation were being performed on a living person, in spite of the untidy appearance that often results.

In actual practice set amputations are becoming less and less common, our aim being to fashion the best possible flaps from the soft tissues available. We must also constantly consider the question of the fitting of an artificial limb subsequently and plan an operation accordingly.

The amputations here described must therefore be looked upon rather as type operations, to enable students to acquire a certain degree of operative dexterity, and not necessarily those generally adopted for the particular part of the limb under which they described.

AMPUTATIONS AND EXCISIONS OF THE UPPER EXTREMITY.

AMPUTATIONS OF THE FINGERS AND HANDS.

The prominences at the joints of the fingers and hand are formed by the ends of the proximal bone of the joint. The metacarpo-phalangeal joint is nearer the wrist than its corresponding fold on the palmar surface of the hand ; but the inter-phalangeal joints correspond exactly to the folds on their palmar surface. The digital arteries and nerves run along the lateral borders of the fingers and are divided in the course of the amputation.

The instruments required for these amputations are a narrow-bladed scalpel, dissecting and artery forceps, scissors, ligatures, needles and sutures.

Amputation of the last phalanx of the fingers. The operator seats himself facing the hand and takes hold of the last phalanx between his left thumb and first finger. The assistant holds the hand palm downwards and the fingers wide apart. The incision begins exactly at the line of the second interphalangeal joint on the side of the finger, at a point midway between the anterior and posterior border, and is carried downwards round the end of the finger, immediately below and parallel to the free edge of the nail, to a corresponding point on the other side of the joint. The incision is deepened and a palmar flap, which includes everything on the front of the phalanx to the bone, is dissected up to the line of the joint. The joint is then strongly flexed and an incision, joining the ends of the palmar incision, is made straight across the back of the finger, opening into the joint. The lateral ligaments are now divided in turn, by pulling the phalanx first to one side and then to the other, and finally the deep flexor tendon and the anterior and glenoid ligaments are cut across on the base of the last phalanx from the palmar surface, after fully extending the joint.

With the phalanx, the nail and the skin of the dorsum as far back as ths joint are removed, but the tendon sheath is not opened as it stops at the end of the second phalanx.

The palmar flap is turned over and sutured on the dorsal surface, where the cicatrix will lie and not on the end of the stump, where it would be constantly exposed to pressure.

This operation may be performed by opening the joint from behind first: and making the palmar flap by passing the blade of the scalpel behind the base of the phalanx and cutting towards the end of the finger.

Amputation at the metacarpo-phalangeal joint. The prominence of the knuckle is formed by the head of the metacarpal bone, but the edge of the web of the fingers is 3/4 in. (2 c.m.) below the joint. The same instruments are required as for the preceding operation, and the assistant holds the hand in the same position.

The incision is begun on the back of the hand over the neck of the metacarpal bone in the middle line of the finger. The incision divides the skin and runs down to just beyond the base of the first phalanx and then bifurcates and runs round the finger to the edge of the web, first on one side then on the other. A palmar incision joins the ends of these two lateral incisions, straight across the fold in the skin between the finger and the palm. The completed incision resembles a crupper (Ar. طفر) The back of the hand is upwards throughout and the fingers are kept well out of the way by the assistant. The incisions are first marked out in skin and are then deepened and, with the finger strongly extended, the flexor tendons are cleanly cut in the line of the palmar incision.The lateral incisions are further deepened to the bone, the arteries divided, and the joint cleared and opened by cutting through the lateral ligaments. The skin and deeper tissues in the palm are now dissected back to the joint, which is opened by a tranverse incision on its palmar side with the finger extended; and finally the extensor tendon is cut, with the finger strongly flexed, and with it the posterior ligament of the joint. The line of the cicatrix lies vertically from before backwards.

The operation just described is suitable for the *third and fourth* fingers, but certain modifications are necessary for the *index and little* finger so as to place the scar out of the way of pressure. In the *index* finger, the first incision starts not over the metacarpal bone but to the side of it nearest to the middle finger. The two lateral incisions run round the base of the finger as in the ordinary operation, but the flap on the radial side must be made fuller than the other, to thoroughly cover the exposed head of the metacarpal bone. The cicatrix will lie close to the middle metacarpal bone and will not be pressed upon by the approximation of the thumb.

Similarly, with the *little finger* the incision is on the radial side of the metacarpal bone and a rather longer flap is made on the ulnar side. The cicatrix lies close to the fourth metacarpal and is out of way of pressure falling on the ulnar border of the hand.

Amputation of the finger with the metacarpal bone. This operation is performed by a similar incision to the preceding operation, but beginning just below the base of the metacarpal bone and running down the whole length of the bone, and then laterally round the base of the finger, as in amputation at the metacarpo-phalangeal joint. The incisions having been deepened and the extensor tendons divided near the base of the bone, the metacarpal is completely dissected out from the palm, working upwards from the web and keeping close to the bone throughout and using the finger as a lever to assist the dissection. The flexor tendons are divided on the neck of the metacarpal bone. Finally the disarticulation is completed at the carpo-metacarpal joint and the long wound sutured from above downwards. The metacarpal bone and the finger must be removed in one piece and the metacarpo-phalangeal joint left intact.

Amputation of the thumb at the carpo-metacarpal joint. The assistant holds the hand midway between pronation and supination, and the operator takes the thumb and begins his incision immediately above the carpo-metacarpal joint in the *tabatiere anatomique.* This incision runs down the back of the thumb rather towards the radial side, then curves round the outer side of the head of the first metacarpal to the middle of the free edge of the web as the thumb is abducted. A second incision runs from the distal end of the dorsal incision round the ulnar side, to join the radial incision at the web, thus completing the crupper incision. The incisions are deepened and the operation completed in every way like the preceding operation, the disarticulation being done at the carpo-metacarpal joint. All the thenar muscles are separated off with the flaps by cutting quite close to the bone, and especially keeping very close to the base of the bone, so as to avoid injury to the radial artery, which is here passing behind the extensor muscles of the wrist on its way to the back of the hand. The line of the cicatrix lies antero-posteriorly, the muscles being brought together to form a good pad in the place of the removed metacarpal bone.

Amputation at the wrist joint. The exact level of the wrist joint is defined by placing the thumb and index finger on the tips of the styloid processes of the radius and ulna.

The instruments required are a moderately long amputating knife, dissecting and artery forceps, ligatures, needles and sutures.

In amputating on the right side, the *assistant* keeps the arm well away from the side and the forearm clear of the edge of the table and supinated. He then takes the fingers, bunches them together, and twists the hand inwards till the forearm is strongly pronated. The *operator* stands on the outer side of the limb, pulls the skin of the lower end of the forearm well upwards with his left hand, and, holding his knife firmly in his right hand with the cutting edge towards him, bends down and passes the knife under the forearm, and places its heel on the ulnar border of the limb, just beyond the level of the bases of the metacarpal bones. He now draws it round across the extensor to the flexor surface, cutting with a sawing movement, and then on to the beginning of the incision; the assistant at the same time twisting the forearm gradually round in the opposite direction, till it finally assumes the position of full supination as the incision is completed. If operator and assistant are in accord and keep proper time together, the circular incision is completed with the one circle of the knife, and the last piece is cut with the heel of the knife as was the beginning. The positions are reversed in amputating on the left side, the operator standing between the body and the limb, the forearm held at first strongly supinated, and the incision begun on the flexor surface. In fact the assistant twists the limb *away* from the operator in all circular amputations.

These are the principles common to all unmodified circular amputations, whether the structures divided are the skin, muscles, or periosteum.

In the case of the wrist joint the incision slopes downwards a little on the radial side and divides skin only nearly all round; but is made deeper as it passes over the thenar and hypothenar eminences, so as to utilise part of the muscles in these situations for a thicker covering to the prominent styloid processes of the radius and ulna respectively.

The flap, which consists of skin only, except where it includes as much as possible of the thenar and hypothenar muscles, is now dissected up like a cuff to well above the wrist joint, till the styloid processes are cleared. The tendons are next cut across, in front with the hand strongly extended and behind with the hand strongly flexed, just below the line of the joint, and retract out of the way; and finally the disarticulation is completed by cutting through, first the internal and external ligaments of the joint, and then the anterior, with the hand extended,and the posterior, with the hand flexed, taking care to disarticulate immediately below the styloid processes and not between the carpal bones. The radial ulnar and superficialis volae arteries are seen in the face of the stump and the flap is brought down and stitched transversely.

AMPUTATIONS OF THE FOREARM.

Amputation through the lower third of the forearm by the circular method. The instruments required are an amputating knife of moderate size, with a blade 5 in. (12.5 c.m.) long, a scalpel, a saw, retractors, three-tailed bandage (the narrow central tail goes between the bones and the two outer ones protect the muscles on either side), dissecting and artery forceps, scissors, needles, ligatures and sutures.

The assistant abducts the arm, straightens the elbow, and holds the forearm in a position of supination. The operator stands to the outer side of the limb on the right side, and to its inner side on the left. The level of the division of the bones is decided upon and the skin incision is made at a distance below, equal to the antero-posterior diameter of the forearm at the saw-line. This distance is measured by placing the left thumb and index finger on the middle of the posterior and anterior surface respectively, with the forearm supinated. Then, keeping the index finger as the centre and the distance between the two the radius of a circle, the thumb is made to describe an arc downwards and forwards till it reaches the anterior surface. If the original distance between the ends of the two fingers has been carefully maintained, the end of the thumb will now be at a distance equal to the diameter of the forearm at the saw line below that line. The assistant now strongly twists the forearm away from the operator, who then makes a circular incision involving the skin only, in exactly the same way as described in the preceding operation. The cuff of skin is reflected as far upwards as the saw line, being slit up the sides if there is any difficulty in reflecting it.

Midway between the saw line and the skin incision, a circular division of the tendons and all the soft parts to the bones is performed, in exactly the same way as in any other circular amputation. The muscles, which are mainly tendinous, having been reflected back to the saw line, and the interosseous ligament divided transversely at this level with a scalpel, the arm is kept well supinated and the bones sawn across, with the soft parts protected by the three-tailed bandage. The heel of the saw is placed on the nearest bone and both bones sawn through together with long steady strokes.

The radial, ulnar, and the interossei arteries are seen and secured, the muscles pulled down as far as possible, and the skin sutured transversely.

Amputation through the middle or upper third of the forearm by antero-posterior flaps. The instruments required and the position of the operator and the assistant are as in the preceding operation.

The base of each flap is equal to half the circumference of the limb at the saw line. The length of the anterior flap is equal to rather more than the antero-posterior diameter of the limb at the saw line, and the posterior is half the length of the anterior. In this way unequal flaps are made and the scar falls on the posterior surface and not directly on the end of the stump.

With the forearm supinated, the operator marks out the anterior flap in the skin, commencing at the level of the saw line on the further lateral border of the limb. He carries the incision downwards for the required distance, then turns across the anterior surface to the nearer lateral border, and then upwards to end at the level of the saw line. The lower end of the flap is made convex downwards with rounded corners. The posterior flap is cut in the same way with convex borders downwards, the lateral incisions being common to both flaps.

Both flaps are now dissected up nearly to the saw line, the muscles divided by a circular incision at the level of the end of the posterior flap and dissected well up off the bones, the interosseous membrane divided, and the bones sawn across at the pre-arranged saw line as in the preceding operation. After the arteries have been secured, the muscles are brought over the ends of the bones and the edges of the skin sutured throughout.

OPERATIONS ON THE ELBOW.

Amputation at the elbow joint by oblique circular method. The instruments required are an amputating knife, scalpel, dissecting and artery forceps, scissors, ligatures, needles and sutures.

The assistant holds the forearm and keeps the arm well away from the side. The operator stands in the same position as for amputations of the forearm, and makes an oblique circular incision through the skin, starting 3 in. (7.5 c.m.) below the level of the elbow joint in front, and running up to 1 1/2 in. (3.75 c.m.) below the line of joint behind; and turns up the skin all round nearly as far as the joint. The muscles are similarly divided by an oblique circular incision just above the level of the original skin incision and reflected up off the bones, and disarticulation effected by first dividing the lateral ligaments, then the anterior and posterior ligaments, and finally the triceps tendon. The brachial artery is secured and also the superior and inferior profunda, the muscles brought down over the prominent end of the humerus and sutured over it, and the skin sutured transversely.

Excision of the elbow joint. The instruments required are a scalpel, periosteal elevator, curved scissors, retractors, dissecting and artery forceps, a saw, ligatures, needles and sutures.

The assistant stands on the opposite side and holds the wrist, flexes the elbow and places the whole limb across the chest. The operator, standing on the side to be operated on, then makes a long incision, starting on the posterior border of the ulnar, 2 in. (5 c.m.) below the elbow joint and running over the tip of the olecranon and on in the same line to a point the same distance above the joint, into the lower third of the arm. The incision is deepened in its whole length, cutting through the triceps muscle above and the posterior ligament of the joint and the periosteum below. The operator then proceeds with the periosteal elevator to reflect all the soft parts, including the periosteum, from the lower end of the humerus and from the upper end of the ulna and olecranon, inwards and outwards. The outer part of the triceps muscle and tendon is first separated and then the inner, taking great care not to injure the ulnar nerve, as it winds round in the groove at the back of the internal condyle of the humerus. The parts below the joint, which consist mainly of fibrous attachments of muscles and periosteum, are freed in the same way, and the lateral ligaments of the joint pulled to either side by retractors. The capsule of the joint is more freely opened just above the olecranon with the elbow strongly flexed, and the ends of the ulna and radius pushed out of the wound, the soft parts all round being still further retracted so as to permit of their complete projection. The ulna is sawn through transversely at the base of the olecranon and all its articular surface removed, and the radius similarly divided across its neck, just below the articular surface of the head. The lower end of the humerus is freed all round and then thrust well out of the wound and sawn across at the base of the condyles.

The ends of the bone are then replaced and the elbow put in the flexed position, the soft parts brought together to form a capsule to the new false joint, and finally the skin is sutured in the line of the original incision.

It must be understood that as this operation is generally performed for tuberculous disease of the joint, the whole of the synovial membrane and any other affected soft parts must be carefully removed before the operation is complete.

AMPUTATIONS OF THE ARM.

Amputation through the lower third of the arm by the circular method. The instruments required are a long amputating knife, a periosteal elevator, a saw, dissecting and artery forceps, ligatures, needles and sutures.

The assistant supports the elbow and forearm, and rotates the arm strongly outwards for the left arm, inwards for the right. The operator stands to the outer side of the right arm, and between the arm and chest wall for the left.

At a distance below the saw-line equal to the antero-posterior diameter of the arm at that level, he makes the incision through the skin, in every way as before described for a circular amputation. The skin is turned back like a cuff to the saw-line, and the biceps divided midway between the saw-line and the level of the circular incision through the skin. This muscle having been pushed upwards, the rest of the muscles are divided by a circular incision well below the saw-line, the periosteum cut in the same way just above, and reflected with the elevator, and, finally, the bone sawn across at the saw-line.

The brachial artery, and the superior and inferior profunda are secured, the muscles brought down over the bone and sutured if possible and the skin stitched up in the antero-posterior direction, after any loose pieces of muscle or long ends of nerves have been removed.

Amputation through the middle or upper third of the arm by antero-posterior flaps. The same instruments are required as for the preceding operation and the assistant and operator stand in the same position. Flaps are cut in the same way as in amputation in the upper third of the forearm, the base of each being equal to half the circumference, and the length of the anterior flap equal to rather more than the diameter of the limb at the saw-line, and the posterior only half the length of the anterior.

The brachial artery lies in the posterior flap and care must be taken not to split the artery in making the first incisions.

The flaps are turned back to the saw-line, the biceps cut long and the other muscles well below the saw-line by circular incision as before, and the operation completed exactly as in the lower part of the arm. The brachial artery and its branches are secured and the flaps sutured transversely, and the cicatrix falls behind and not directly over the end of the stump.

Amputation through the shoulder joint. The instruments required are a stout excision knife with a four-inch blade (10 c.m.,) dissecting and artery forceps, ligatures, needles and sutures.

The arm is slightly abducted and rotated outwards. The operator standing to the outer side of the limb, feels the tip of the coracoid process, and makes an incision from just outside this point straight down the arm, to the level of the lower border of the pectoralis major. This incision is deepened and opens up the space between the pectoralis major and the deltoid, and exposes the long head of the biceps lying in the bicipital groove. A second incision is then made from the lower end of the first, outwards round the arm, dividing some of the lower fibres of the deltoid and ending at the middle of the posterior fold of the axilla. This incision is also deepened to the bone; and a third incision, in skin only, is made from the lower border of the pectoralis major in front, at the end of the first incision, straight round the inner side of the arm to the end of the second incision, at the posterior border of the axilla. By the deepening of the two first incisions the beginnings of a large external muscular flap are made, and this is now dissected up well above the joint, keeping the knife close to the bone to preserve the posterior circumflex artery. The muscles inserted round the capsule of the joint are now divided by cutting on the head of the bone and the tuberosities transversely, that is, at right angles to the line of the shaft of the bone, the humerus being rotated as this is done. The joint is opened from the outer side and the ligaments completely divided, except those on the posterior surface of the glenoid cavity. The arm is now abducted and rotated outwards and the head of the bone pushed out of the glenoid cavity. The operator takes hold of the head, pulls it outwards, cuts transversely through the posterior portion of the capsule of the joint,and then turns the blade downwards and, keeping close to the bone, completely clears the neck of the humerus of its attachments. The operator keeps the knife in this position and the assistant now stands on the opposite side of the body, and takes hold of the remaining soft tissues between his thumb and forefinger. The operator now cuts out towards the chest wall, in the line of the third incision, while the assistant firmly grasps the axillary vessels, which are in the mass of soft tissues, and holds them till they are secured with forceps and ligatured. This last cut completely separates the limb, and after the axillary vessels are secured, the nerves are cut off short and the wound closed antero-posteriorly. The axillary artery may be secured and divided between two ligatures, through an incision in the axilla, before beginning the operation, if thought advisable.

Excision of the shoulder joint. The same instruments are required as for the preceding operation, with the addition of retractors and a periosteal elevator.

The position of the arm is the same, and the incision is made from just outside the tip of the coracoid process to the lower border of the pectoralis major as before. The incision is deepened and the long head of the biceps exposed in the bicipital groove and carefully pulled inwards out of the way. The incision is further deepened in its upper part to open into the joint, and the arm is strongly rotated outwards and the

subscapularis divided by cutting at right angles to the line of the shaft. It is then rotated inwards and the supraspinatus infraspinatus and teres minor divided on the greater tuberosity, by cutting transversely down on the tuberosity; and the capsule more freely opened to allow the head to be pushed out of the joint. When this is done and the structures on the inner side of the neck are well separated, the saw is applied just below the head of the humerus and the bone sawn through at its surgical neck. The shaft of the bone is returned into the joint cavity, the capsule sutured and the muscles and the skin sutured vertically. In the case of tuberculous disease, the whole disease, whether in synovial membrane, other soft parts, or in bone, must be thoroughly removed before the operation is complete.

AMPUTATIONS OF THE LOWER EXTREMITY.

AMPUTATIONS OF THE TOES. Much that has been written about the amputations of the fingers also applies to the toes. The palm of the hand corresponds to the sole of the foot, and the amputations of the last phalanges, the metatarso-phalangeal amputations, and the removal of the whole toe with its metatarsal bone, are performed in precisely the same way as in the corresponding situations in the hand. The same modifications are required for amputations at the metatarso-phalangeal joint of the great toe, and of the fifth toe, as is the case with the index and little fingers.

AMPUTATIONS OF THE FOOT.

Before describing these operations the *topographical anatomy of the foot and ankle* must be briefly referred to; as without the proper determination of the bony points, the lines of the incisions of the various operations cannot be accurately placed. The two malleoli are quite evident, the internal being broader and not so prominent as the external, which is lower and further back than the internal. On the inner side of the foot, the prominence of the inner tuberosity of the os calcis is seen most posteriorly, then a deep groove between it and the internal malleolus. Exactly below the internal malleolus the sustentaculum tali is felt; 1 ¼ in. (3.5 c.m.) in front of the malleolus, the tubercle of the scaphoid is evident and then the prominent ridge of the base of the first metatarsal bone, while between these two points lies the internal cuneiform. The shaft of the first metatarsal is easily followed and also its prominent head, with a sesamoid bone on each side.

On the outer side of the foot, the os calcis is almost subcutaneous throughout. A little below and in front of the external malleolus, is the peroneal tubercle on the os calcis, separating the peroneus brevis tendon above from the peroneus longus below; 2 ½ in. (6.5 c.m.) in front of the malleolus, the base of the fifth metatarsal bone is very prominent, and, just behind this bone, the cuboid can be felt in the greater part of its extent.

A line drawn transversely across the dorsum of the foot, from just behind the tubercle of the scaphoid, corresponds to the joints between the astragalus and scaphoid, on the inner side, and the os calcis and the cuboid externally, the mid-tarsal joint, the outer point being midway between the external malleolus and the base of the fifth metatarsal bone.

Amputation at the tarso-metatarsal line of articulations. Lisfranc's operation. The instruments required for this operation are a strong narrow-bladed knife, 5 inches long (12. 75 c.m.) in the blade, a scalpel, retractors, dissecting and artery forceps, ligatures, needles and sutures.

The foot is drawn well over the end of the table and the leg well raised. The operator grasps the right foot with his left hand, the palm on the dorsum, and strongly plantar-flexes it. He then cuts a short dorsal flap slightly convex towards the toes, starting from just behind the base of the fifth metatarsal bone, then across the dorsum of the foot to end just behind the base of the first metatarsal. The incision follows the lateral border of the foot for about 1 inch (2.5 c.m.) before turning across the dorsum; and runs up the opposite lateral border for the same distance before it ends. This flap is at once dissected up, in skin only, to well behind the line of joints, the extensor tendons being divided just before this level is reached. The plantar flap is now cut by strongly dorsal-flexing the foot and entering the point of the knife on the lateral border,in the outer end of the dorsal incision. The incision then runs downwards towards the toes following the outer margin of the fifth metatarsal for a short distance, then passes obliquely across the foot just behind the heads of the metatarsal bones, near the web of the toes,to the head of the first metatarsal. Here it turns backwards towards the heel and, following the inner margin of the first metatarsal bone, ends in the inner end of the dorsal incision. This flap is now dissected up, including the skin only as far as the hollow just behind the heads of the metatarsal bones, and from that backwards all the structures of the sole, until it is completely reflected beyond the line of the tarso-metatarsal joints. The bunch of tendons is divided transversely just behind the heads of the metatarsal bones.

With both flaps held well out of the way, the foot is grasped, strongly plantar-flexed, and pulled inwards. The knife then cuts through the ligaments immediately behind the base of the fifth metatarsal and those of the three outer joints, cutting through the tendons of the peroneus brevis and tertius in the same incision. The innermost joint is now divided by twisting the foot outwards and cutting between the internal cuneiform and the first metatarsal. The joint between the second metatarsal and the middle cuneiform is now opened on the dorsum. To complete the separation, the knife must be held like a dagger and its point introduced deeply between the bases of the first and second metatarsal bones, the cutting edge turned towards the ankle. The point of the knife is now made a fixed point, as it rests on the internal cuneiform, and by pushing the handle towards the ankle the strong connecting interosseous ligament in this space is divided. The rest of the separation is easily done by cutting any remaining ligaments and the peroneus longus tendon, which is pulled well out and cut at the outer end f the incision. The four dorsal interosseous arteries are seen on the

dorsum, and the plantar connecting branch of the dorsalis pedis between the first two metatarsal bones. In the plantar flap are seen the digital arteries of the external plantar and the artery itself more posteriorly. The internal planter is divided on the inner side.

The incisions are made from within outwards when operating on the left foot.

The inner side of the flap must be fuller than the outer. The flat facets on the three cuneiform bones and the divided facet on the cuboid are seen in the stump, and show that the right joints have been opened. It is quite easy to carry the flaps too far back and to remove the foot between the scaphoid and the internal cuneiform bone.

The wound is sutured transversely and the cicatrix lies well on the dorsum of the foot.

Hey's operation is exactly similar to Lisfranc's, but, instead of performing the difficult disarticulation of the first from the second metatarsal bone, the four outer joints are opened, and the projecting end of the internal cuneiform is sawn through in the line of the outer joints and carries the first metatarsal with it.

Amputation of the foot at the mid-tarsal joint. Chopart's operation. This operation is seldom if ever done in practice, but is here included, as it teaches the application of surgical anatomy and is good practice in operative work.

The instruments are the same as for the preceding operation, as also the position of the foot and the operator. On the right foot the dorsal incision starts from a point midway between the tip of the external malleolus and the base of the fifth metatarsal bone on the outer side. It follows the outer border of the foot for a short distance, then runs across the bases of the metatarsal bones to the inner side of the foot, and up along its inner border,to end just behind the tuberosity of the scaphoid. This flap is dissected up in skin only to beyond the line of the joint, the extensor tendons being divided just below this level. The planter flap starts at the end of the dorsal flap externally, runs down the outer border of the foot and then across the sole, over the middle of the shafts of the metatarsal bones, to the inner side, then along the inner border to end in the inner end of the dorsal flap.

The direction of the incisions is reversed for the left foot.

The plantar flap contains all the structures of the sole and is well dissected back ; after which the foot is pulled inwards and plantar-flexed, and the outer joint, between the os calcis and the cuboid, opened. It is then turned outwards and the inner joint, between the astragalus and the scaphoid, opened in the same way. The operation is completed by dividing any pieces of soft tissues between the bone that still may be uncut. If the right joints have been opened, the rounded head of the astragalus will be seen in the stump on the inner side, and the hollowed-out facet of the scaphoid on the part removed ; whereas, if the disarticulation is too far forwards, the joint between the scaphoid and the cuneiform bones is opened, and the scaphoid with its convex facet for

the three cuneiform bones is left in the stump. On the outer side the single articulating surface on the os calcis for the cuboid should be seen in the stump, and not the two facets of the cuboid for the fourth and fifth metatarsal bones.

In the dorsal flap the dorsalis pedis will be cut and its tarsal and metatarsal branches, and also the two saphenous veins. In the plantar flap, the internal plantar artery on the inner side, and the external plantar at the base of the second metatarsal bone, will require ligature.

The wound is sutured transversely and the cicatrix lies on the dorsum.

The disadvantage of this operation is that there is no muscle attached to the dorsal surface of the stump, which is drawn backwards by the tendo Achillis and the weight of the body eventually falls on the end of the stump.

Amputations through the ankle-joint. Syme's operation. In this operation the whole foot is removed and a flap is taken from the heel. The two malleoli are subsequently sawn off above the articular surfaces of the lower ends of the tibia and fibula, so as to leave a flat surface to the stump.

As the blood supply to the heel is not very good, care must be taken not to divide the internal calcaneal branch of the external plantar artery on the inner side, and the external calcaneal from the posterior personal on the outer. By making the incision exactly as described these vessels will escape injury.

The intruments are much the same as for the preceding operation; but a strong, short ankle-knife (Syme's knife) is necessary and a saw and periosteal elevators.

The operator keeps the right foot at right angles to the leg and enters the point of the knife immediately below and 1/2 inch (1.25 c.m.) behind the tip of the internal malleolus, The incision passes transversely across the sole, well in front of the point of the heel, to end at the posterior border of the tip of the external malleolus. This incision is exactly at right angles to the long axis of the sole of the foot and is deepened in its whole extent to the bone. The two extremities of this incision are now joined by another at right angles to it, straight across the front of the ankle-joint, the foot being well plantar-flexed in so doing. This incision being deepened the joint is laid open between the two malleoli. The plantar flap is now dissected up, keeping close to the bone of the heel so as not to make any holes in the flap, and reflected well above the joint. This dissection is not at all easy. The foot is now plantar-flexed and disarticulation effected by cutting through the lateral ligaments of the joint and the rest of the capsule ; and finally the tendo Achillis is cut across just above its attachment to the heel. The malleoli are cleared and the lower ends of the tibia and fibula sawn across just above the margin of the articular surface of the tibia.

In the dorsal flap the anterior tibial artery is cut; and the two plantar arteries on the inner side of the heel flap.

The incision is sutured transversely, and the cicatrix lies well on the front. The weight of the body falls upon the flat surface of the lower ends of the tibia and fibula, which is well covered by the dense tissues of the heel flap.

In *Pirogoff's* operation the flaps are longer, the incisions being further forward; the disarticulation is first effected from the front and the saw is then placed on the bare surface of the os calcis, behind its articular facet for the astragalus, and the bone sawn straight backwards, right into and through the plantar incision. Thus the bony point of the heel is preserved and, when the tibia and fibula have been sawn off, the two bony surfaces are approximated and a bony stump is left.

Excision of the ankle-joint. Kocher's operation. The instruments are the same as for Syme's operation. The foot is turned to the inner side, and an incision is made just in front and parallel to the outer margin of the tendo Achillis, starting about 3 ins. (7.5 c.m.) above thé tip of the external malleolus and curving round it below, to end midway between the external malleolus and the base of the fifth metatarsal bone, well beyond the line of the astragalo-calcanean joint. The skin and fascia are divided, the sheath of the peroneus longus and brevis opened in the whole length of the incision, and the tendons drawn backwards, or divided and subsequently re-sutured. The periosteum is separated from the external and under surface of the external malleolus, and the ankle-joint opened in front of the malleolus. The capsule of the joint is now detached along the outer surface of the astragalus, and the lateral ligament of the joint completely divided close to the external malleolus. The capsular ligament of the joint and the periosteum is separated from the anterior border of the tibia as far as the internal malleolus, the tendons being drawn upwards, and the posterior surface of the tibia cleared in the same way. The foot is now forcibly dislocated inwards over the internal malleolus, so that the head of the astragalus looks downwards and the sole of the foot upwards. The ankle-joint and the inferior tibio-fibular joint can now be examined and treated as necessary, and the astragalus can also be removed entirely, with the surrounding diseased synovial membrane and other affected parts. Whenever possible, the strong internal lateral ligament of the ankle-joint is left intact; but, if it has to be divided, it should be cut close to the tip of the internal malleolus or a piece of that bone taken with it. The tendons are re-sutured or replaced, the foot put up at right angles, and the incision sutured. Drainage may be provided by tube if thought necessary.

AMPUTATIONS OF THE LEG.

Amputation of the leg by equal lateral flaps. The instruments required for this operation are a stout scalpel, an amputating knife with a long blade,a periosteal elevator, retractors, a saw, artery and dissecting forceps, ligatures, needles and sutures.

In amputations of the leg and thigh the operator stands on the outer side when operating on the right limb, and between the legs when operating on the left. In making circular incisions the assistant first rotates the right limb inwards and the left limb outwards, that is away from the operator.

Amputation may be performed in any part of the leg by lateral skin flaps and circular division of the muscles, but this operation is especially applicable to the upper half.

The leg is drawn well over the edge of the table. Two lateral skin flaps are marked out, each equal in length to half the diameter of the limb at the saw-line and a little over to allow for retraction. The incision begins in front at the saw-line, just inside the crest of the shin, and ends at a corresponding point behind. The flaps are oblong, with rounded ends, and are dissected up in skin and subcutaneous tissue to the saw-line. The muscles are then divided by a circular incision well below the level of the saw-line, the gastrocnemius and soleus being cut longer than those on the front owing to their greater retraction. The muscles are dissected up from the bones and the interosseous membrane is now cut transversely at the saw-line, with the periosteum, which is then stripped up from the bone to just above the saw-line. The saw is now placed upon the prominent edge of the tibia just above the saw-line,and made to cut obliquely downwards into the bone as far as the future saw-line. The saw is then withdrawn and the leg turned inwards, so that the saw rests on the two bones together and divides the fibula first, the saw cutting through the tibia at the base of the oblique cut. When the bones are divided the small triangular piece of bone falls off, and leaves a sloping edge on the previously sharp and prominent border of the shin. The periosteum is turned down over the divided bone, and the anterior and posterior tibial arteries and their branches secured.

The muscles are then brought together over the ends of the bones and the skin sutured vertically, the cicatrix thus lying directly over the end of the stump.

The skin flaps must be made long enough, but not too long, and, if the operation is properly performed, the stump is a good one.

Amputation through the lower third of the leg should be avoided, if possible; but when the bone has to be divided at any point below the middle of the tibia an *amputation by a large posterior flap* is to be preferred.

The general principles of this operation are similar to those of the antero-posterior flap operations already described in amputations of the upper limb. In this case the posterior flap is equal in length to half the circumference of the limb at the saw line. The inner part of the incision runs straight down from the saw line, in front of the inner border of the tibia, across the leg at the proper level, and then straight up on the outer side, behind the external border of the fibula, to the saw line again.

The skin and soft parts are cut right down to the muscles; then, in the upper part of both the inner and the outer incisions, the cut deepened through the underlying muscles to the tibia and fibula respectively. in this situation are now easily separated from The muscles the bones and the interosseous membrane with the handle of the knife, and picked up between the thumb and first finger of the left hand. The tendo Achillis, or the gastrocnemius, is then cut across quite at the lower end of the incision, and, after this has retracted, the rest of the muscles are cut rather obliquely down to the bone from below upwards. The blade of

the knife may be entered above and the muscles cut by transfixion, the incision running first obliquely downwards and outwards, the tendo Achillis being the last muscle divided, and then straight out into the posterior incision which has been made in the skin in the first steps of the operation. This large muscular flap is now further separated from the underlying bones and interosseous membrane and reflected well up to the saw line.

The anterior flap is one quarter the length of the posterior, and is cut deeply in skin and subcutaneous tissues. The incision is further deepened through the underlying muscles, which are separated from the bones and interosseous membrane, and turned up, as part of the flap, to the saw line.

The lateral incisions are common to both flaps, which have rounded corners and are slightly convex downwards.

The division of the interosseous membrane and the periosteum, and the sawing of the bones, is then completed as in the preceding operation.

The anterior tibial artery is secured in the anterior flap and the posterior tibial and peroneal in the posterior. The internal saphenous vein may be met with the inner part of the incision.

The muscles are sutured across the ends of the bones, and then the skin, the cicatrix in which lies well on the front of the leg.

OPERATIONS ON THE KNEE.

Amputation through the knee joint by lateral flaps. Stephen Smith's operation. The instruments required are the same as for the preceding operation, but no saw or elevator is required. The leg is brought well beyond the edge of the table and an incision is made from a point 1 inch (2.5 c.m.) below the tubercle of the tibia in front, to end in the centre of the popliteal space behind, at the level of the knee-joint. The flaps are 2 ins. (5 c.m.) long in front, and the inner one is made rather fuller than the outer so as to cover the more prominent inner condyle. They have rounded convex borders and consist of skin only, and are dissected up to the level of the joint. The ligamentum patellae is cut across as it is exposed, and the joint opened by cutting transversely across between the head of the tibia and the semilunar cartilages. These cartilages are thus left attached to the lower end of the femur, and the crucial ligaments are cut close to their attachment to the tibia. The leg is then well extended, and all the soft parts posteriorly cut straight across at the level of the joint.

The popliteal artery and vein must be secured, and the flaps are then sutured vertically.

The patella and the semilunar cartilages are left and form a good pad over the condyles, and the cicatrix lies in between the two condyles.

Excision of the knee-joint. The instruments required are an excision knife, a scalpel, strong curved scissors, periosteal elevator, artery and dissecting forceps, ligatures, needles and sutures.

The knee is slightly flexed, and a curved incision is made, starting from the posterior margin of one condyle and ending at a corresponding point on the other, and crossing the ligamentum patellae just before its insertion into the tibia. The knee is now more flexed and the incision is deepened in its whole extent, dividing the ligamentum patellae and all the anterior and lateral capsular ligaments of the joint. The patella and its ligament are pulled up and the crucial ligaments divided. The whole joint is thus very freely opened and the articular surfaces exposed. The limb is now strongly flexed and the sole of the foot rests on the table. The lower end of the femur is cleared at the level of the saw-line above the articular margin, and the saw applied in such a way that the saw-cut will be at right angles to the long axis of the femur and, at the same time, parallel to the upper margin of the articular surface of the condyles. The bone is now sawn through, the soft parts being protected by retractors. The upper end of the tibia is now pushed well up into the gap, the tibia still remaining quite vertical. The bone just below the articular margin is cleared and sawn across, the saw-line being exactly at right angles to the long axis of the tibia, and parallel to the plane of the articular surface. The patella may now be removed, or its articular surface sawn off; and then all the diseased synovial membrane and other affected soft parts removed, the ends of the bones being scraped or gouged as necessary. The two cut surfaces of bone are now approximated, and, if the sawing has been properly done, they ought to fit quite accurately and are fixed with wire, ivory pegs, or a nail. The ligamentum patellae and the capsule of the joint are sutured, and finally the skin.

AMPUTATIONS OF THE THIGH.

Amputation through the femur at or just above the condyles. Godlee's operation. The instruments required are as for excision of the knee joint.

An ordinary circular incision, involving the skin only, is made just above the level of the tuberosity of the tibia, and the flaps dissected up like a cuff well above the condyles. The soft parts are then divided by a similar incision at the proposed saw-line and the bone sawn across, either just above the widest part of the condyles, or above the condyles. The patella may be left, its articular surface sawn off and then fixed to the cut surface of the femur. If this is done the ligamentum patella is divided below and reflected with the anterior portion of the flap. It is then sutured to the periosteum and deep fascia at the back of the femur before the skin incision is sutured.

The popliteal artery and vein are secured, and the edges of the skin flap sutured transversely.

In *Carden's operation* in the same situation, a large anterior flap, similar in shape to that used in excision of the knee, but larger and more broadly convex, is turned up in skin and fascia to the upper border of the patella. The joint is opened by a transverse incision at this point, and the upper ends of the incision deepened to the bone. The whole flap is then reflected up to the saw-line. The soft parts behind are now divided, by cutting in a half circular incision down to the femur posteriorly, at the

saw line. The lower articular end of the femur is cleared and the bone sawn through at the desired level. Similar modifications may be made as mentioned in the preceding operation, depending upon the selected level of the section of the bone and the wish to preserve the patella.

The vessels are secured as before and the incisions sutured, the scar lying well on the posterior side.

Amputation through the lower third of the femur by a modified circular operation. The instruments are as for the preceding operation but must include a long amputating knife. The limb is brought well over the edge of the table and the operator stands in the proper position,to the outer side of the right limb to the inner side of the left.

Owing to the unequal retraction of the muscles in this situation an ordinary circular amputation is not satisfactory, but has to be modified. The incision must be made obliquely, the posterior half being considerably lower than the anterior. The circumference of the thigh is taken at the saw-line, and, at a distance equal to one-quarter of this measurement below it, the anterior part of the incision begins. It slopes backwards and downwards until, posteriorly, the skin is divided at a considerably lower level than anteriorly. The incision is done in every other respect like an ordinary circular incision, the assistant carefully manipulating the limb as required. The flap of skin is well dissected up to the saw-line; and the muscles divided by a circular incision, starting in front well below the saw line and running obliquely downwards in the same way as the skin incision. The bone is well cleared, the periosteum divided by circular incision, and the bone sawn across, the saw-cut taking an upward direction in the last inch so as to cut the linea aspera smooth behind.

The femoral artery, or the first part of the popliteal, and the accompanying vein, must be secured, and the anastomotica magna. The muscles are secured over the ends of the bones, and the skin then sewn up transversely,.or slightly obliquely, running from the front backwards and inwards.

Ampution in this situation may also be done by antero-posterior flaps as in the middle of the thigh.

Amputation through the middle or upper third of the thigh by antero-posterior flaps. The instruments and position are the same as for the preceding operation, but the flaps are best marked out with a scalpel.

The base of each flap equals half the circumference of the limb at the saw-line. The length of the anterior flap is one diameter and a half below the saw-line, and of the posterior half a diameter. They have the usual oblong shape, with rounded ends, and consist of skin and superficial parts only. They are cut in the ordinary way (or they may be cut by transfixion with the underlying muscles), and then reflected to the saw-line. The muscles and soft parts are then divided by a circular incision well below the saw-line, cutting the muscles on the inner and posterior surface rather longer, on account of their greater retraction. The femoral artery is secured, and its deeper branches, the muscles secured over the ends of the bones, and the flaps sutured transversely, the cicatrix lying well on the posterior surface of the thigh.

This operation may also be done by marking out the skin flaps and deepening the incisions to the muscles; and then dividing all the muscles covering the bone, by cutting obliquely upwards to the saw-line from the distal ends of the flaps, first anteriorly, then posteriorly.

OPERATIONS ON THE HIP.

Disarticulation at the hip-joint. Furneaux Jordan's operation. The instruments required are a long-bladed amputation knife, a stout excision knife, periosteal elevator, a saw, dissecting and artery forceps, lion forceps, ligatures, needles and sutures.

The limb is pulled well away from the body and supported by the assistant. Another assistant makes pressure on the femoral artery at Poupart's ligament to prevent haemorrhage; or, better, an incision is made over the artery at the intended level of the first circular incision, and the artery and vein secured and divided between two ligatures.

At any desired distance below the hip-joint, the skin is first divided by a circular incision down to the muscles. A cuff of skin is turned up for 3-4 ins. (7.5-10 c.m.) and then the muscles divided at this level by a circular incision, which cuts through all the structures right down to the bone. The bone is then sawn across at this point, and the femoral vessels secured, if they have not already been ligatured. Steadying the cut end of the femur with lion forceps, the operator now makes a long incision on the outer side of the thigh, extending from a point midway between the tip of the great trochanter and the crest of the ilium, straight down through skin and soft parts on to the femur in its whole length. Still seizing the divided end of the bone with a lion forceps, two large curtains of soft tissues are dissected up anteriorly and posteriorly, the knife being kept close to the bone throughout and gradually enucleating it from the surrounding soft parts from below upwards, as far as the trochanter. Using the now bare piece of femur as a lever, the trochanter is cleared in the same way and the capsule of the joint opened above it, the femur being strongly adducted and rotated inwards in so doing. Once the joint is opened the rest of the capsule is cut across transversely to the direction of its fibres; and, finally, the ligamentum teres divided as the head of the bone is strongly rotated outwards. The inner parts of the capsule are now divided and the disarticulation completed.

All that remains is a huge musculo-cutaneous curtain divided down its outer side, and this is sutured along the lines of the original incisions, the muscles being turned in and separately sutured.

Excision of the hip-joint. An excision knife, periosteal elevator, a saw, possibly a chain saw, dissecting and artery forceps, ligatures, needles and sutures are required.

With the thigh extended and the body lying on the opposite side, and the knee slightly flexed, a straight incision about 6 inches (15 c.m.) long is made right down to the bone and the capsule of the joint, on the outer side, in the long axis of the limb and just behind the middle of the great trochanter. Two-thirds of this incision lie above the trochanter and the other third below it.

The capsule is freely opened in the depths of the incision and then divided transversely above the trochanter. The muscles attached to the great trochanter are divided close to their insertion into the bone, the limb being rotated in different directions to put them on the stretch as they are divided. The ligamentum teres is divided, if it still exists, and the head of the bone is dislocated backwards, pushed out of the wound, well cleared of attached soft parts, and sawn across at its neck, as near the junction with the trochanter as necessary. All other affected soft parts and deposits in the acetabulum, or remains of the fumer, must be removed, and the joint drained or treated as required. The skin incision is sutured or otherwise dealt with, and the limb put up straight on an appropriate splint.

PART III.

MISCELLANEOUS OPERATIONS.

EXCISION OF THE UPPER JAW. The body lies on the back with the head on a pillow, and the operator stands on the side to be operated on.

The special instruments required are a scalpel, periosteal elevator, a gag, a tooth forceps for the incisors, bone forceps, a keyhole saw, and a Hey's or other small saw.

The skin incision is made from below and internal to the inner canthus of the eye, down along the lateral groove between the nose and the cheek, round the curve of the nostrils to the middle line, then vertically downwards, dividing the upper lip exactly in the middle line. A second incision is made along the lower border of the orbit to the prominence of the malar bone. These incisions are deepened and the whole flap, consisting of all the soft parts of the cheek and upper lip, is turned outwards on to the face. The periosteum at the lower margin of the orbit is now divided and separated upwards, the contents of the orbit protected, and the anterior part of the spheno - maxillary fissure, externally, and the groove in the lachrymal bone, internally, defined. The nasal cartilages are detached from their lateral connections with the superior maxilla. The nasal process of the superior maxilla is now divided with a bone forceps, the line of division extending from the margin of the nasal duct bony aperture to the lachrymal groove. The piece of bone between the anterior end of the spheno-maxillary fissure and the external surface of the malar bone is sawn through, downwards and outwards, care being taken to leave the malar prominence untouched. The further stages of this operation are hardly possible on the dead body, but are as follows :—

The central incisor tooth on the operated side is now removed with the tooth forceps and a gag inserted. The mucous membrane of the hard palate is divided in the middle line, and the soft palate divided transversely at its junction with the hard. With the keyhole saw placed in the nostril the alveolar and palatal processes are sawn through; and, finally, the whole bone is wrenched out, by placing one blade of the lion forceps on the margin of the orbit, the other in the mouth, and twisting it firmly downwards and outwards. The posterior wall of the antrum

must be removed in the complete operation, and the skin sutured along the lines of the original incision.

EXCISION OF HALF OF THE LOWER JAW. The incision begins in the middle line in front, just below the red margin of the lip and runs downwards to the symphysis. It then follows the lower margin of the jaw all round as far as the lobule of the ear. The incision is deepened to the bone, the facial artery and vein would be secured, and all the soft parts, including the mucous membrane along the line of the teeth, separated off the bone, and turned up as a flap on to the face. Only in very recent bodies can anything further be done in an operative surgery class on the dead body; but in the living patient we proceed as follows:—

The jaw is then sawn through with a fine saw just to one side of the middle line, and the mucous membrane, muscles, and soft parts of the floor of the mouth, separated from below and inside as far as the angle of the jaw. The jaw is then pulled outwards and the internal pterygoid muscle separated from the bone ; then the temporal muscle and the inferior dental artery and nerve are divided. Finally, the external pterygoid and the capsular ligament of the temporo-maxillary joint are cut from the inner surface, and the condyle of the jaw wrenched from its socket, taking care of the internal maxillary artery near the neck of the bone. The cavity may then be packed from the mouth, and the skin incision sutured after securing the vessels.

TRACHEOTOMY. This is not a satisfactory operation on the dead body, but is important on account of the parts involved in the operation.

The body lies on the back, with a small pillow under the lower part of the neck and the head kept quite straight. The cricoid cartilage is felt and an incision made in the middle line of the neck, immediately below the cartilage, for about 2 inches (5 c.m.) This incision divides the skin, the anterior jugular vein, and the platysma, opens up the space between the sterno-hyoid and sterno-thyroid muscles, and exposes the isthmus of the thyroid gland running across the first two or three rings of the trachea. The parts being retracted and the isthmus pulled upwards, the lower margin of the cricoid is fixed with a sharp hook and pulled upwards. The trachea is then opened by cutting upwards towards the cricoid through the third, second, and first rings of the trachea. Still retaining hold of the cricoid the dilating forceps is introduced into the tracheal incision and opened; and along the curve of the blades the outer tracheotomy tube is inserted. After seeing that the tube is properly in its place, the dilating forceps is removed and the tube tied in by tapes passing round the neck. The inner tube is then inserted and the wound closed round the outer tube with sutures.

EXCISION OF RIBS. An incision is made straight down on to the rib for a distance of 3-4 inches (7.5-10 c.m.) cutting through all the overlying soft parts and the periosteum. Then, with a periosteal elevator and a dissecting forceps, the periosteum is reflected from the bone; first on the external surface, like two flaps, then over the upper border, and then the lower border, keeping everywhere close to the bone so as to avoid injury to the intercostal vessels.

The internal surface is then separated and the bared piece of rib cut through with bone forceps. The unopened pleura, pericardium, or

peritoneum, should be exposed and is divided above and parallel to intercostal artery.

GASTROSTOMY. In the dead body it is not possible to do more than expose the stomach and bring it out of the wound in the abdominal wall. Details of the further stages of the operation must be sought elsewhere.

The incision may be made straight downwards from the junction of eighth and ninth left costal cartilages at the costal margin, thus opening into the outer margin of the sheath of the left rectus muscle. The muscle is drawn inwards and the posterior layer of its sheath opened in the same line, and with it the peritoneum. The stomach is then sought and is recognised by its trasversely curving muscle fibres,its smooth surface, the attachment of the gastro-hepatic omentum and the absence of appendices epiploicae. A cone of the organ near the greater curvature, on its anterior surface, is drawn out of the wound and dealt with as necessary. The stomach may also be exposed by an incision just below the costal margin on the left side, extending from the outer edge of the rectus at the ninth costal cartilage outwards and downwards for about 2 ins (5 c.m.) The various muscles and fascial of the abdominal wall are divided in the line of the incision and then the peritoneum.

CHOLECYSTOTOMY. All that can be done in the dead body is the exposure of the gall-bladder. This is done by a straight incision downwards from the tip of the ninth right costal cartilage, which opens the abdomen through the sheath of the rectus in the same way as just described for gastrostomy. The lower edge of the liver is seen and projecting below it is the gall-bladder, which may be sutured to the deeper parts of the abdominal wall if possible. An incision parallel to the lower margin of the ribs may also be employed.

APPENDICECTOMY. An incision is made through the outer edge of the sheath of the rectus, crossing a line from the umbilicus to the anterior superior iliac spine obliquely. The rectus muscle is displaced inwards, and the posterior layer of the sheath and the peritoneum is opened, and search made for the appendix, the inner border of the caecum and its junction with the ileum being the best landmark. The longitudinal band of the ascending colon running on to the caecum and its appendices epiploicae will be useful as guides; but it is impossible to say exactly where the appendix will be placed, so varied is its position and direction. Having secured the appendix it is drawn out of the wound with a portion of the caecum. The meso-appendix is transfixed, the artery to the appendix ligatured, and the meso-appendix divided. The neck of the appendix is crushed in a forceps and, while thus held up, a purse-string suture is placed well beyond the base of the appendix in the caecum, piercing the two outer coats only, and left untied. The appendix is then ligatured behind the clamp, and the distal part cut off; the stump is then invaginated into the caecum as the purse-string suture is drawn tight and tied. Some reinforcing sutures may be inserted over the point of invagination and the gut returned to the abdomen. The abdominal wall is then closed in layers.

It is not always possible to complete the operation for appendicitis as above described on the dead body.

INGUINAL COLOTOMY. An incision is made in the inguinal region on the left side 2 ins. (5 c.m.) above Poupart's ligament and parallel to it. The different layers of the abdominal wall are divided in order, aponeurosis of external oblique, internal oblique, transversalis and transversalis fascia, and extra-peritoneal tissue, and finally the peritoneum in the line of the original incision. Search is then made for the sigmoid flexure, which is recognised by its shape and size, its longitudinal muscle band, and its appendices epiploicae. The selected portion is then sutured to the parietal peritoneum of the incision all round, and the colotomy opening made within the circle of gut thus isolated.

THE RADICAL OPERATION FOR INGUINAL HERNIA. The external ring is defined and a free incision made above Poupart's ligament and parallel to it. The incision will lie over the inner half of Poupart's ligament with the external ring as its middle point. The skin is divided and superficial branches of the circumflex iliac artery. The aponeurosis of the external oblique is exposed and is divided freely right down into the ring. The lower flap of aponeurosis is then separated from the deeper tissues and, on its under surface, will be seen the strong bundle of fibres forming Poupart's ligament; and near the inner end, Gimbernat's ligament, at its insertion into the ilio-pectineal line. The upper flap is turned up and exposes the internal oblique muscle with its continuation downwards over the cord, the cremaster muscle and fascia; and, arching over the upper and inner part of the gap, the conjoined tendon, formed by the union of the internal oblique muscle and the transversalis. This is inserted into the symphysis pubis and the bone behind it and varies in its composition, sometimes being mainly muscular and sometimes aponeurotic and fibrous.

The spermatic cord is now exposed lying in the opened-up inguinal canal and, should there happen to be a hernia present, the hernial sac, lying on or amongst the constituents of the cord. The operation could then be completed by isolating and ligaturing the sac beyond its neck, that is to say, right on the peritoneum beyond the real neck of the sac. Then, leaving the cord exactly where it is,the conjoined tendon is sutured to the deep under surface of Poupart's ligament from above downwards, leaving only sufficient room below for the passage of the cord into the scrotum. The cut edges of the external oblique aponeurosis are then sutured nearly down to the insertion of the pillars of the external ring, and, finally, the skin.

LUMBAR NEPHRECTOMY. The body is placed on the side, with a hard pillow under the loin. A free incision is then made, from the angle formed by the last rib meeting the outer border of the erector spinae, obliquely forwards and downwards towards the anterior superior iliac spine, and further forwards in the same line if more room is required. The skin is first divided and part of the sheath of the erector spinae opened in the upper end of the incision. Then the latissimus dorsi and the posterior parts of the external oblique will be divided and the lumbar fascia exposed beneath them. The lumbar fascia is now divided and opens up the peri-renal space with its fat and loose connective tissue. Nothing more can be profitably done on the dead body, but if it were possible, the operation would continue as follows:—

The wound being well and deeply retracted, the kidney is felt in the depths, largely hidden behind the last rib, and is carefully shelled out of its bed, care being taken not to damage the peritoneum, which lies in front and through which the colon may be clearly seen. Some assistance may be given by pressing on the front of the abdomen to push the kidney into the space. The kidney is finally brought out of the wound, the ureter the renal artery and vein ligatured, and the organ removed. Deep sutures and drainage are usually required, and the skin incision is then sutured as completely as the nature of the operation permits.

As a further APPENDIX, which is likely to be particularly useful to students in a land where artificial limbs are rarely seen, except in their most primitive form, I am including an article published in the Lancet of June 16th, 1917, by Colonel Openshaw, R.A.M.C., on AMPUTATIONS CONSIDERED FROM THE ARTIFICIAL LIMB POINT OF VIEW: which would only be spoiled by any attempt of mine to edit it. He writes : —

"I venture with all diffidence to state my opinions on the relative merits of the various amputations from the artificial limb point of view."

"With regard to the UPPER EXTREMITY, it is possible to fit an artificial limb to any part. One finger or the thumb of the natural hand is more useful than any apparatus. If only the thumb or one finger is left, artificial fingers or an artificial thumb can be fitted, so that the patient has something to which he can oppose the remaining digit.

Amputation of the *wrist joint* should not be done if it is at all possible to leave any portion of the hand, for it gives too long a stump for the proper application of an artificial hand. It is necessary to put the artificial wrist-joint at the end of the natural wrist-joint, and this brings the hand too far away from the elbow, and much power is lost.

For officers or patients engaged in clerical pursuits, a *new wrist-joint* should be made by removal of one and a half inches of the radius and ulna, for to this joint an artificial hand can be fitted, so that the flexion and extension movements are converted into flexion of the interphalangeal joints of the index and middle fingers. This operation shortens the forearm and increases the power of the flexors of the elbow, and replaces the hand as efficiently as is at present possible. The best site for amputation of the forearm is one where the bones are divided at the lower end of the middle third of the forearm, for this gives a powerful useful stump, not too long, and capable of full pronation and supination.

A *forearm stump* where the ulna measures three and a half to four inches from the tip of the olecranon is often exceedingly difficult to fit with an artificial forearm bucket. The stump repeatedly slips out of the forearm bucket. As the supinator longus, the extensor muscles, and the flexors are useless, these should be removed in order to produce a flat surface upon which the upper anterior edge of the forearm bucket can rest. This is especially necessary if the forearm muscles are large. If not more than two inches of the ulna (measured from the tip of the olecranon) can be left, the amputation should be performed above the condyle of the humerus.

Amputation at the elbow-joint should never be performed as an operation of election, for it is difficult, though not impossible, to fit an artificial arm to the stump. If it is imperative that the amputation

tion should be through this joint, the condyles must be removed, for if left it is impossible to accurately fit an arm socket unless it be laced up the whole length of the front, which considerably weakens it.

The best site for *Amputation of the arm* is one between a point one and a half inches above the elbow joint on the one hand, and three inches below the fold of the axilla on the other, and an endeavour should always be made to divide the humerus between these two points.

It is difficult to fit an artificial limb to a stump which projects only one inch below the fold of the axilla, but it still more difficult to fit one where the stump does not project at all.

With regard to *the shoulder* it is easier to fit an artificial limb to an amputation where the head of the bone has been completely removed than it is to fit one to an amputation through the surgical neck of the humerus. But, in spite of these difficulties, one should always remember that it is possible to fit an artificial limb to any amputation of the upper extremity.

At the shoulder-joint, by means of a moulded leather cap, an artificial arm is adjusted to the body. Considerable space should be allowed between the arm and the chest wall by flattening the inner surface of the arm, so as to facilitate dressing. By adjustable straps and wires, the movements of the opposite shoulder can be utilised to bend the elbow of the artificial arm, and by a similar arrangement, passing round the chest and down the artificial arm to the thumb, the latter can be moved by abducting the opposite arm.

It is interesting to observe that, in spite of the endeavour of the patient to make the utmost use of an artificial arm, nature constantly asserts the usefulness of the remaining member. If the left arm is lost above the elbow there will be a constantly increasing tendency to use the right arm for everything. This is also noticeable to an increasing extent where the right arm has been lost, for the patient will become left-handed and use his left hand more and more wherewith to perform every function."

THE LOWER EXTREMITY.

"Before passing on to a consideration of the *amputations for the lower extremity,* let me remind you that in all cases, no matter where the site may be, it is essential that the nerve trunks should be cut as short as possible, and that the end of the stump should be covered with a loose movable non-adherent skin-flap.

With regard to *the foot* if the amputation has been of the digits and the bone is well covered with the scar on the dorsum, an artificial boot can easily be fitted, and the patient walks well.

A guillotine *amputation through the centre of the tarsus* should always be looked upon as a temporary measure, to be replaced by a Syme's amputation as soon as the patient has recovered from the effects of the sepsis and can tolerate a further operation.

No skin-grafting of a granulating *Chopart* gives the least chance of a useful stump. The scar ultimately becomes the lowest part of the foot in consequence of the contraction of the tendo Achillis, and will not

bear the weight of the body without ulceration. Months of suppuration have often followed a guillotine operation performed through the centre of the tarsus. A Syme is ultimately necessary, and should be resorted to early.

Neither a *sub-astragaloid amputation,* nor a *Pirogoff,* gives the most useful foot. In both these amputations the lowest end of the leg is pointed and irregular, the stump is too long, and the artifitial foot so narrow as to prevent the ankle-joint being fixed in the artificial foot itself.

A *Syme's amputation* is the best about the ankle-joint. It should be performed exactly as described by its originator, the malleoli and a layer of the tibia a quarter of an inch thick being removed. This gives room for a joint in the artificial foot itself instead of in the lateral steel supports.

Any *amputation through the leg* between the ankle joint (Syme) and a point six inches below the top of the tibia must be looked on as likely to give an unsatisfactory stump, and one which is, therefore, a tentative amputation.

It is permissible in France to perform such an amputation, because it is always doubtful whether the flaps will or will not slough ; but such a method gives an unsatisfactory stump which is thinly covered, badly nourished, liable to blueness, anaemia, ulceration, and sinus formation. It is only permissible as a temporary expedient.

The *best amputation of the leg* is one where the bone is cut four to five inches from the upper edge of the tibia ("seat of election"), where the lower end of the tibia is square, and where it is well covered with healthy movable skin. A patient with such an amputation can carry a considerable part of the weight of his body on the end of the tibia, the remainder being borne by the lateral surface of the tibia and fibula and partly along the surface of thigh, i. e. the points of purchase of the socket which carries the artificial limb.

After this amputation, with a well-fitting artificial limb, a patient can walk, run, and dance in such a way as to render it absolutely impossible even for an expert, to decide which leg is artificial.

In this amputation the fibula ought to be cut half an inch shorter than the tibia, otherwise it seems to increase in length and project. Should, however, the end of the tibia not be well covered with movable skin, the weight of the body cannot be borne on the end of the stump, and has to be carried on the lateral surface of the tibia and fibula, the sides of the thigh, and the tuber ischii.

It is imperative that in any amputation at the upper third of the leg the knee-joint should be kept straight, as flexion may render a further amputation necessary, either through the knee-joint, or just above it. If the knee-joint is allowed to become flexed the hamstrings and the posterior ligaments contract and shorten,and all these structures, even the posterior ligament, may require division ; and even then it may be impossible to straighten the leg, and amputation at or above the knee-joint may be necessary.

Even one inch of the tibia, if well-covered on the under surface, gives a more useful stump than an amputation through or above the knee-joint. Endeavours should always be made to divide the tibia in such

a way, and at such a point, as to get a good covering for its cut under-surface. If this is not possible, or if the flaps slough, or if for any reason it is inevitable that there will be a scar over the end of the tibia, it is better to remove the tibia and the patella by some sort of incision similar to that for a Stephen Smith amputation.

In every *Stephen Smith amputation,* the patella ought to be removed, for if left it retracts and forms a wobbling excrescence, which prevents the accurate fitting of a thigh bucket. It is quite easy by means of an accurately fitting leather bucket, fitted with lateral steels jointed opposite the tubercles on the condyles of the femur, to fit an artificial leg to an amputation through the knee-joint. An artificial leg so made and jointed does not cause the projection of the artificial knee beyond that of the normal knee when sitting down, and the gait of a patient wearing such an artificial leg is excellent.

A *transcondylar amputation of the femur,* if well covered, gives a very good stump, but the edges of the bone should be rounded off, and the periosteum should be pushed up and replaced over the edges of the divided bone. In any amputation above the condyles up to a point higher than the middle of the femur, the artificial leg should be made with a lacing bucket of leather, not wood. This lacing leather bucket should be made of strong sole leather and should fit accurately to the thigh. The tuber ischii should rest upon its upper edge, so that the patient's weight is transferred to the ground through the tuber ischii and partly through the friction of the skin against the inside of the bucket. As the thigh shrinks the bucket can be tightened in the lacing, doing away with the necessity of having a new bucket fitted, or of wearing sometimes as many as a dozen thigh socks.

At or above the middle of the femur every amputation case should be fitted with a pelvic band, which should be accurately moulded to the body before the steel is hardened. It should extend from just below the anterior superior spine on the affected side, round the body below the iliac crests to the opposite anterior superior iliac spine. The hip-joint in this pelvic band should be at a point opposite the centre of the great trochanter and half an inch above it. Such a pelvic band prevents the wobbling of the thigh and considerably improves the patient's gait.

Amputation in the upper third of the thigh, where the bone is divided at any point between the small trochanter and two inches below it, gives a stump well-nigh impossible to fit with an artificial limb. If more than two inches of bone below the small trochanter cannot be left, then the femur should be divided at the small trochanter or through the great trochanter.

It is easier to fit an artificial limb where the bone has been exarticulated at the hip-joint than it is where the bone has been divided through the great trochanter or at the small trochanter ; so that, if a long thigh stump cannot be made, there need be no hesitation in removing the upper end of the femur, provided, of course, that the condition of the wound as to sepsis, and of the patient, will allow of this rather more severe proceeding."

FINIS

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